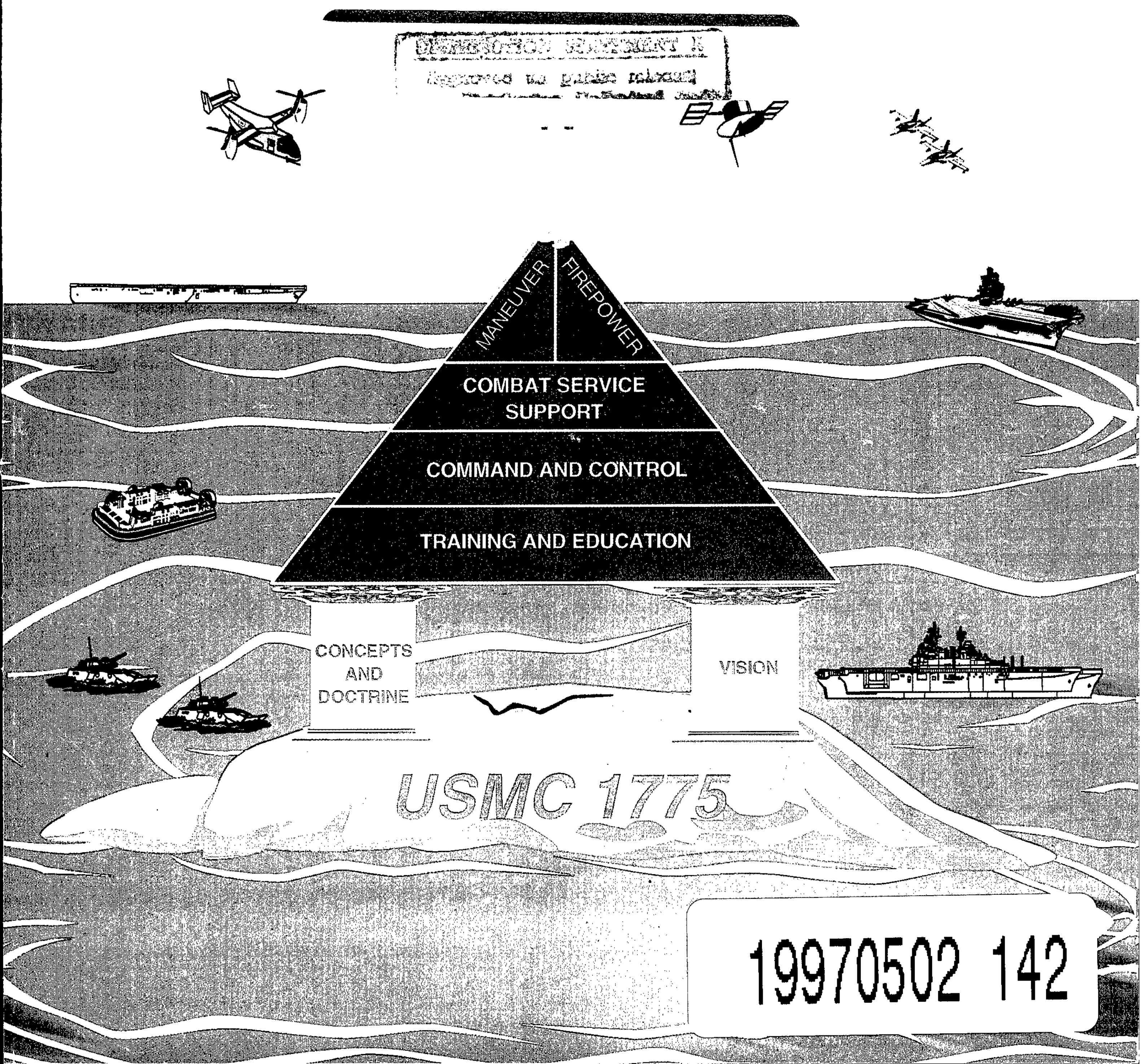
MARINE CORPS
ADVANCED TECHNOLOGY DEVELOPMENT PROGRAM

FISCAL YEAR 1997
TECHNOLOGY PROGRAM PLAN
PE 63640M



AQ F 1197-CC-3946 FY97 Technology Program Plan PE63640M

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Carroll D. Childers
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CARROLL D. CHILDERS
Print or Type Name

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SUBMITTED:

David A. Vaughn 9 SEPT 96

(signature & date)
David A. Vaughn, Director
MARCORSYSCOM (AW)

ENDORSED:

J. E. Rhodes 9 Sep 96

(signature & date)
MajGen J. E. Rhodes
Deputy CG, MCCDC

APPROVED:

M J Williams

(signature & date)
MajGen M. J. Williams
COMMARCORSYSCOM

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ADDENDUM SHEET

NAME OF SECTION OF WARFIGHTING IMPERATIVE REVISED	DATE OF CHANGE	PAGE NO.(S) AFFECTED	CHANGE ENTERED BY

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EXECUTIVE SUMMARY

INTRODUCTION

The Marine Corps, in Title 10, United States Code (USC), is tasked to develop, in conjunction with the Navy, Army, and Air Force, those phases of amphibious operations that pertain to tactics, techniques, and equipment used by the landing force. This Technology Program Plan (TPP) covers a broad range of technology thrusts that will lead to new or improved capabilities in a variety of functional areas that support the landing force. The specific technology efforts respond to the needs determined by the first Marine Corps Science and Technology Expeditionary Warfare Roundtable I, the Commandant's Planning Guidance (CPG), dated 1 July 1995, approved Non-Acquisition Category Program Definition Documents (NAPDDs) and emerging concepts and doctrine.

Amphibious Warfare (AW) is the joint responsibility of the Navy and Marine Corps as defined in the National Security Act of 1947 (amended) and Department of Defense (DoD) Directive 5100.1. Essentially:

a. The Navy provides the shipping, landing craft, and fire support during the initial phase of an amphibious operation.

b. The Marine Corps provides the landing forces and amphibious assault vehicles and assumes the responsibility for its own fire support (aircraft and artillery) once the Landing Force is established ashore.

c. The Marine Corps has the lead for the development of Landing Force doctrine, tactics, techniques, and equipment which are of common interest to the Army or one of the other services.

As good as we are today, we will need to be even better tomorrow. We must not be afraid of reaching outside of the traditional realms of defense acquisition or technology. CPG

Be ever mindful of technological opportunities to enhance combat proficiency and to promote logistic economy. CPG

USMC STRATEGIC CONCEPT

In all that we say and do, we must continually return to the strategic concept that makes the Corps a unique institution within our national military establishment. That concept, articulated by Congress and contained in law in Title 10, USC, reflects our very ethos:

The Marine Corps, within the Department of the Navy, shall be so organized as to include not less than three combat divisions and three air wings, and such other land combat, aviation, and other services as may be organic therein. The Marine Corps shall be organized, trained, and equipped to provide fleet marine forces of combined arms, together with supporting air components, for service with the fleet in the seizure or defense of advanced naval bases and for the conduct of such land operations as may be essential to the prosecution of a naval campaign.

In addition, the Marine Corps shall provide detachments and organizations for service on armed vessels of the Navy, shall provide security detachments for the protection of naval property at naval stations and bases, and shall perform such other duties as the President may direct. However, these additional duties may not detract from or interfere with the operations for which the Marine Corps is primarily organized.

The Marine Corps shall develop, in coordination with the Army and the Air Force, those phases of amphibious operations that pertain to the tactics, techniques, and equipment used by landing forces.

The Marine Corps is responsible, in accordance with integrated joint mobilization plans, for the expansion of peacetime components of the Marine Corps to meet the needs of war.

The words of the 82nd Congress, so carefully crafted and articulated nearly 45 years ago, provide us with the foundation we need to move into the 21st century.

"...The nation's shock troops must be the most ready when the nation generally is least ready ... to provide a balanced force in readiness for a naval campaign and, at the same time, a ground and air striking force ready to suppress or contain international disturbances short of large-scale war."

As America's premier force-in-readiness, the Marine Corps must continue to train and equip itself for the challenges of the next century. This confidence is firmly grounded in the Corps' proven track record of being ready through continuous introspection and coordinated investment in emerging technology. Marines play a unique and vital role in our national security. Capabilities inherent in flexible Marine Air-Ground Task Forces (MAGTF) operating as part of naval expeditionary forces, a capability the Marines have continuously refined since the 1930's, are tailor-made for contingencies in today's uncertain world. Additionally, the Marine Corps' institutional qualities of adaptability, innovation, cost consciousness, and tradition of success ensure that the Marine Corps will remain ready, relevant, and capable in the future. Despite unclear security challenges in the new world order, the Marine Corps' well established

"911" role will remain a constant in both crisis response and joint sea-air-land operations with other services in execution of the National Military Strategy. In sum, the Marine Corps will continue to provide a certain force for an uncertain future.

INVESTMENT DETERMINATION AND COORDINATION PROCESS

The Marine Corps System Command's (MARCORSYSCOM) Science and Technology (S&T) Program efforts are completely integrated with the Marine Corps Combat Development Command's (MCCDC) Combat Development Process (CDP) as described in Annex A. Objectives are driven by the Expeditionary Warfare S&T Roundtable process which systematically identifies capability deficiencies and assesses technology that is being, or could be, applied to correct the deficiencies. The S&T Roundtable process is described in Annex B. The overall investment determination and coordination process is completely compatible with the Concept Based Requirements System (CBRS) managed by MCCDC.

MARINE CORPS SCIENCE AND TECHNOLOGY RESPONSIBILITY

Marines have long been known as "innovators" and "improvisers." As part of our ethos, and together with our strategic concept, innovation and improvisation serve as the foundation upon which we will continue to build our institutional objectives and translate them into a vision for the Marine Corps of the 21st century. The basis for that vision must be operational and strategic concepts devised through the CDP and made possible, in many instances, by technological innovation especially selected for the littoral environment and integrated into the battle force holistically, fully compatible, and with an architecture for expansion and adaptability. Responsibility for managing S&T processes and programs within the Marine Corps is vested in MARCORSYSCOM and is delegated to the Director, Amphibious Warfare Technology (AWT) Directorate. AWT executes its responsibility for S&T by directly managing all facets of Small Business Innovation Research (SBIR), Applied Research (6.2), Advanced Technology Development (6.3), and the transition of technology products and programs. Further, AWT coordinates efforts with Program Managers (PM) within MARCORSYSCOM to ensure that successful efforts have funded transition paths. Thus, AWT ensures an end-to-end process such that technology investments are based on approved operational concepts; that they address capability deficiencies; that they reflect a priority articulated by the CG, MCCDC; and, that they are based on a holistic plan that has an executable path to fielding. Figure 1 reflects the management model that accomplishes the integrated S&T planning processes.

CURRENT FOCUS AND ORGANIZATION

The DoD S&T Program consists of Basic Research (6.1), Applied Research (6.2), and Advanced Technology Development (6.3). This plan focuses on Advanced Technology Development (6.3). From the S&T Roundtable, the eight Thrust Areas of previous year publications have been consolidated and organized into five Warfighting Imperatives:

Maneuver; Firepower; Combat Service Support (CSS); Command and Control (C2); and Training and Education. Figure 2 depicts this transformation.

ADVANCED TECHNOLOGY DEMONSTRATION PROCESS

a. The ATD Program (6.3) is a balanced, complete technology program that bridges the Applied Research (6.2) and Advanced Development/Engineering Development (6.4/6.5) programs. The ATD identifies and reduces technology risk prior to committing to an acquisition category (ACAT) program, and helps to define the operational requirement by demonstrating technological feasibility in a quasi-operational environment. The ATD identifies development options as well as military worth, and presents an opportunity to build a user-developer consensus. Finally, the ATD process provides the necessary data for a smooth transition to the receiving Program Manager (PM) to support a Milestone I decision.

b. The ATD process directly supports the Concept Development, Capabilities Assessment, and Requirements Determination efforts of the CDP. By providing input into the Cost and Operational Effectiveness Analysis (COEA) and conducting technology development/demonstration aimed at risk reduction leading to Milestone I/II approval, it also supports meeting the operational requirement. The ATD program, in effect, bridges the Concept Based Requirements System (CBRS) and the Solution Development System (SDS) portion of the CDP. The Reader is directed to Annex E for more information on the ATD/Transition process.

FISCAL SUMMARY

The Fiscal Summary for this 6.3 program is shown in Table 1.

TABLE 1. ADVANCED TECHNOLOGY DEVELOPMENT (6.3) FISCAL SUMMARY FOR FY96-FY01 BY WARFIGHTING IMPERATIVE.

WARFIGHTING IMPERATIVE	FY96	FY97	FY98	FY99	FY00	FY01
Maneuver	10788	7460	6358	5620	7326	5598
Firepower	5839	5997	4366	3411	1955	3300
Combat Service Support	977	2710	2658	3510	2950	3581
Command And Control	2566	3378	4851	3805	4619	5740
Training And Education	4284	2993	4570	4617	4500	5327
Total	24454	22538	22803	20963	21350	23546

6.3 MANAGEMENT

The responsible project management personnel for the 6.3 program are shown in Table 2.

TABLE 2. 6.3 MANAGEMENT PERSONNEL BY WARFIGHTING IMPERATIVE

WARFIGHTING IMPERATIVE	AWT POC	LABORATORY POC
Maneuver	LtCol. W. Hamm 703-784-4790, DSN 278	Mr. M. Gallagher, NSWCDD 301-227-1852, DSN 287
Firepower	Mr. G. Chambers 703-784-4973, DSN 278	Mr. R. Stiegler, NSWCDD 540-653-8141, DSN 249
Combat Service Support	Maj. T. Manley 703-784-4788, DSN 278	Ms. L. Torres, NFESC 805-982-1388, DSN 551
Command and Control	Maj. T. Manley 703-784-4788, DSN 278	Mr. C. Mirabile, NCCOSC 619-553-4161, DSN 553
Training and Education	LtCol. W. Hamm 703-784-4790, DSN 278	Mr. D. Freer, NAWC 407-380-4181, DSN 960

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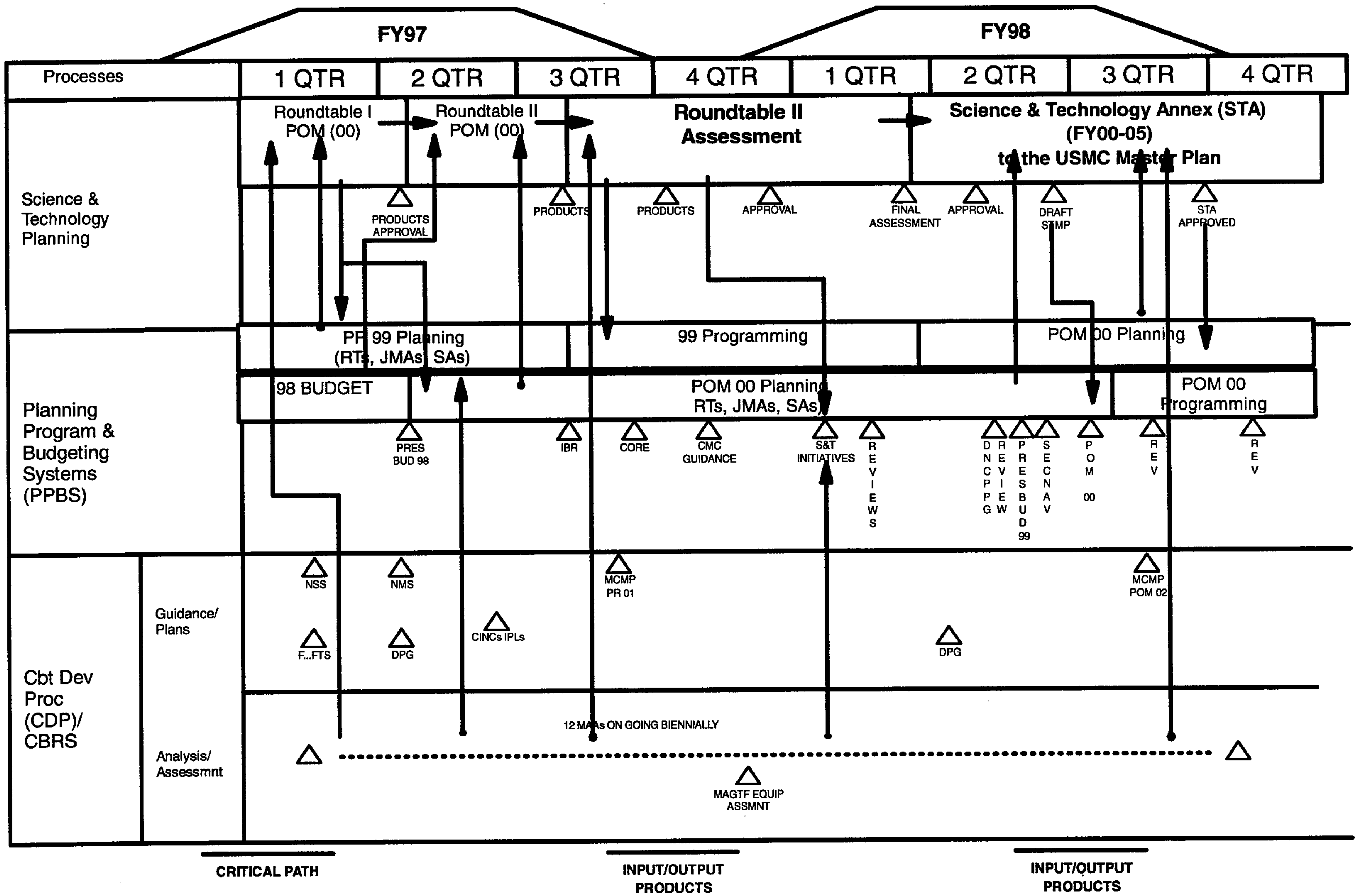

FIGURE 1. INTEGRATED PLANNING PROCESSES

ACRONYMS
FOR
FIGURE 1. INTEGRATED PLANNING PROCESSES

CBRS	CONCEPT BASED REQUIREMENTS SYSTEM
CDP	COMBAT DEVELOPMENT PROCESS
CINC	COMMANDER IN CHIEF
DNCPPG	DEPARTMENT OF NAVY CONSOLIDATED PLANNING AND PROGRAMMING GUIDANCE
DPG	DEFENSE PLANNING GUIDANCE
F..FTS	FORWARD FROM THE SEA
FY	FISCAL YEAR
IBR	INVESTMENT BALANCE REVIEW
JMA	JOINT MISSION AREA
MAA	MISSION AREA ANALYSIS
MAGTF	MARINE AIR-GROUND TASK FORCES
MCMP	MARINE CORPS MASTER PLAN
NMS	NATIONAL MILITARY STRATEGY
NSS	NATIONAL SECURITY STRATEGY
POM	PROGRAM OBJECTIVE MEMORANDUM
PPBS	PLANNING PROGRAM AND BUDGETING SYSTEMS
PR	PROGRAM REVIEW
PRESBUD	PRESIDENTIAL BUDGET
QTR	QUARTER
RT	ROUNDTABLES
S&T	SCIENCE AND TECHNOLOGY
SA	SUPPORT AREA
SECNAV	SECRETARY OF THE NAVY
STA	SCIENCE AND TECHNOLOGY ANNEX
STMP	SCIENCE AND TECHNOLOGY MASTER PLAN

	MANEUVER	FIREPOWER	COMBAT SERVICE SUPPORT	COMMAND AND CONTROL	TRAINING AND EDUCATION
PRE-RT ORGANIZATION OF TECHNOLOGY THRUST	SURFACE MOBILITY SURVIVABILITY MCM MINE DETECTION	TARGETING SENSORS WEAPONRY	ADVANCED AMPHIBIOUS LOGISTICS	MAGTF C4I	
EMERGING AND CURRENT ATDs	FUTURE LIGHT VEH ATD MAGTF SURV ATD JAMC ATD COBRA ATD MCM ACTD RFPI ACTD MOUT/MOBA ACTD	FXXI LW OICW ATD ALGW	ADV AMPHIB LOG/CSS	ICOC ATD JT TAC COM ATD	JT M&S ATD TTES ATD MAGTF INDIV CBT SUP ATD RANGE INSTRUMENTATION

A WORK IN PROGRESS

FIGURE 2. MARINE CORPS S&T VISION TO ENABLE OMFTS

ACRONYMS
FOR
FIGURE 2. MARINE CORPS S&T VISION TO ENABLE OMFTS

ACTD	ADVANCED CONCEPTS TECHNOLOGY DEMONSTRATION
ADV	ADVANCED
ALGW	ADVANCED LIGHTWEIGHT GROUND WEAPONRY
AMPHIB	AMPHIBIOUS
ATD	ADVANCED TECHNOLOGY DEMONSTRATION
C4I	COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS AND INTELLIGENCE
CBT	COMBAT
COBRA	COASTAL BATTLEFIELD RECONNAISSANCE AND ANALYSIS
COM	COMMUNICATIONS
CSS	COMBAT SERVICE SUPPORT
FXXI LW	FORCE XXI LAND WARRIOR
ICOC	INTEGRATED COMBAT OPERATIONS CENTER
INDIV	INDIVIDUAL
JAMC	JOINT AMPHIBIOUS MINE COUNTERMEASURES
JT	JOINT
LOG	LOGISTICS
MAGTF	MARINE AIR-GROUND TASK FORCE
MCM	MINE COUNTERMEASURES
MOBA	MILITARY OPERATIONS BUILT-up AREAS
MOUT	MILITARY OPERATIONS IN URBANIZED TERRAIN
M&S	MODELING AND SIMULATION
OICW	OBJECTIVE INDIVIDUAL COMBAT WEAPON
OMFTS	OPERATIONAL MANEUVER FROM THE SEA
RFPI	RAPID FORCE PROJECTION INITIATIVE
RT	ROUNDTABLE
S&T	SCIENCE AND TECHNOLOGY
SUP	SUPPORT
SURV	SURVIVABILITY
TAC	TACTICAL
TTES	TEAM TARGET ENGAGEMENT SIMULATOR
VEH	VEHICLE

INTRODUCTION

WARFIGHTING IMPERATIVES AND SUPPORTING 6.3 PROJECTS

Maneuver

Projects and Objectives. The principal objective of the projects within the Maneuver imperative is the development and demonstration of the technologies and concepts necessary to provide advanced and enhanced capabilities to effectively conduct amphibious operations and subsequent operations ashore in spite of the future mine and obstacle threat.

The Marine Corps has an urgent and continuing need for the capability of remotely performing beach reconnaissance for mobility assessment. The detection of all types of mines and obstacles during operations from the very shallow water and surf zones inland is critical to ensuring successful OMFTS.

The Maneuver imperative also includes the integration of emerging technologies to enhance the combat and tactical vehicle fleets with increased mobility, and improved survivability, and improved Reliability, Availability, Maintainability, and Dependability (RAM-D).

Coastal Battlefield Reconnaissance and Analysis (COBRA). The objective of the COBRA project is to demonstrate, in an operational environment, a system incorporating advanced multispectral imaging sensors in an Unmanned Aerial Vehicle (UAV) to achieve a capability for reconnaissance of the beach area, Craft Landing Zones (CLZ), and inland. This system will detect obstacles, fortifications, vehicles, mine fields, and mines prior to and during an amphibious assault and subsequent land combat operations. It will also perform terrain analysis in the littoral areas.

Providing the means to complete the reconnaissance and analysis of coastal battlefield areas such as Landing Craft Air Cushion (LCAC) landing areas, CLZs, and inland areas from a UAV will optimize the use of obstacle and mine clearance assets in support of tactical mobility for high tempo assault operations.

Joint Amphibious Mine Countermeasures (JAMC). The JAMC project will demonstrate countermeasure techniques to neutralize light obstacles and land mines in preparation for amphibious assaults. The JAMC ATD effort will emphasize a near term (1-3 years), fieldable capability that will be effective from the transition area of the beach zone and into the CLZs. It is integrated with Army and Navy efforts.

Off-Route Smart Mine Clearance (ORSMC). The ORSMC project will develop and demonstrate countermeasure techniques to neutralize the emerging threat of advanced (off-route smart mines (ORSM)) to both light and heavy forces and to enhance survivability of

combat and logistical vehicles in situations ranging from heavy force breaching operations to logistical supply. It is joint with the Army.

Joint Integrated Electric Mobility Demonstration (JIEMD). The focus of the JIEMD ATD project is the development an demonstration of new vehicle concepts that enhance and support future OMFTS missions. Using advanced technologies such as electric/hybrid electric drive, improved suspension, and higher horsepower propulsion systems, analyses are performed to determine the operational payoff in terms of mobility, survivability, supportability, and affordability.

Several concepts within the JIEMD ATD are joint projects with US Army, Defense Advanced Research Projects Agency (DARPA), and US Special Operations Command (USSOCOM) organization.

Major Accomplishments

COBRA. Under the 6.2 COBRA program, Standoff Mine Detection Ground (SMDG): system concepts were conceived and developed; technologies were assessed and trade-offs identified; breadboard systems were designed, fabricated, tested, and demonstrated on land and from helicopter; technical feasibility was established; and, critical issues to be addressed during the ATD program were identified. The SMDG research demonstrated the ability to configure a UAV compatible system.

The COBRA sensor system successfully completed Developmental Test (DT)-0 testing at Eglin Air Force Base and Camp Lejeune. The sensor suite was mounted aboard a Cessna 172 to facilitate data collection. Preliminary results indicate that the system will meet the ATD goals of a probability of detection greater than 0.80 and a probability of false alarms less than 0.30.

JAMC. A systems trade-off analysis and concept development in support of Tactical Memorandum (TACMEMO)/Operational Handbook (OH) development were conducted during the fourth quarter of FY 93. A full-up system demonstration was conducted in November 1995.

ORSMC. A MARCORSYSCOM and Belvoir Research Development and Engineering Center (BRDEC) jointly funded 6.2 research phase has developed countermeasure concepts consisting of deception techniques that replicate the acoustic and seismic signatures of potential targets to initiate the premature launch of the ORSM threat.

JIEMD. JIEMD project efforts in FY95 focused on the definition of future vehicle needs, characteristics, and stated capabilities to fulfill anticipated OMFTS requirements. Multiple vehicle concepts were formulated and assessed against future scenarios of operation and postulated military missions and needs. Using several different evaluation techniques, four future vehicle systems were highlighted as those having the most promise in meeting the needs of the Marine Corps in the future. Because these systems are very different from currently

fielded or planned Marine systems, they offer an opportunity to take advantage of new systems architectures.

Firepower

Sensors

Projects and Objectives. Electronic, computer, and communications equipment need constant updating to keep pace with technology. This project focuses on implementing advances in these fields for several key battlefield tools and applications.

Advanced Systems for Air Defense (ASAD). This ATD will demonstrate passive detection, acquisition and recognition of air targets for the Short Range Air Defense (SHORAD) unit use in forward battle areas. Electronic Support Measure (ESM) and Acoustic Passive Sensor technologies will be exploited. Advanced processing and fusion technologies will also be utilized. The ASAD project is fully integrated into the evolving SHORAD effort and will demonstrate vehicle and man-portable systems.

Advanced Targeting Sensor System (ATSS). This ATD will develop and demonstrate integrated innovative tactical sensor technologies that enhance the engagement performance of direct and indirect fire weapons (including Close Air Support (CAS), Artillery Fire Support, and Sea Based Fire Support) for the conduct of Maneuver warfare by tactical ground commanders. Earliest possible target acquisition, increased first round hit probability, successful Identification Friend or Foe (IFF), own-position, and accurate Battle Damage Assessment (BDA) are the goals of the technical demonstration .

Forward Observer/Forward Air Controller (FO/FAC). This ATD will develop and demonstrate a man-portable and integrated target acquisition and communication system which will provide Marine FOs and FACs enhanced capabilities to: quickly and accurately locate ground targets for attack by indirect fire weapons and close air support; rapidly transmit targeting data to fire support elements; operate with current and future Marine man-portable laser target designators; and, quickly and accurately adjust fire. This ATD will also include field testing to characterize the technical performance of the system as well as demonstrate and validate its operational utility and effectiveness.

Force XXI Land Warrior (FXXI LW). Previously titled 21st Century Land Warrior (21 CLW), this effort will demonstrate a data network integrating reconnaissance, target acquisition, and other systems which will greatly increase the infantry man's area of influence and lethality in the 21st century combat environment. The data network will integrate survivability systems (ballistic protection, laser and flash protection, microclimate control, chemical sensors, mine detection, medical sensors, and individual power); command, control and communication (voice, combat identification (ID), IFF, image transfer, positioning/navigation, squad member location); augmented day and night vision (Night Vision Goggles (NVG), new imaging infrared (IR) video, thermal sighting, Helmet Mounted Display (HMD); and, lethality

systems. The result will be a system that is man-portable and that provides all the necessary data in a manageable way.

The Generation (GEN) II ATD completed Phase II of five scheduled phases. The outcome of this phase was the development of four GEN II prototypes, two physical and two functional, and the assessment of these prototypes with users (both Marines and soldiers). The continuing program has been renamed the FXXI LW program and is structured to continue S&T efforts in support of the Army's Land Warrior (LW) program. The follow-on program will continue to support future dismounted warrior S&T and will culminate with a squad level demonstration in FY98.

Major Accomplishments.

ASAD. The ASAD acoustic and electronic sensors have undergone DT-0 tests at: Quantico, VA; Camp Lejeune, NC; Fort A.P. Hill, VA; Yuma, AZ; Ft. Bliss, TX ; Naval Surface Warfare Center Dahlgren Division (NSWCDD), Dahlgren, VA; and, various contractors' facilities. Preliminary results indicate that some ATD goals have been met. More tests are scheduled to test sensors against all test requirements. Plans are underway to form a Joint Service program with the Army.

ATSS. New start for FY97.

FO/FAC. The FO/FAC target acquisition system successfully completed DT-0 testing at: the Rockwell facility in Cedar Rapids, IA; China Lake and 29 Palms, CA; Yuma, AZ; Camp Lejeune, NC; and, NSWC Dahlgren, VA. Test results indicate that all ATD goals have been met. The program transitioned to the PM CBG on February 6, 1996. AWT is in the process of completing the OT-0 testing at China Lake for CAS, Camp Lejeune for Field Artillery (FA), and Puerto Rico for Naval Surface Fire Support (NSFS).

FXXI LW. The FXXI LW program is recognized as a model program by the DoD for the implementation of Integrated Product Teams (IPTs) and Integrated Product and Process Development (IPPD). A significant accomplishment was the completion of the development of the first physical and functional prototypes, two each. The prototypes completed user assessments by soldiers at Fort Benning, GA and by Marines at Quantico, VA as well as system functional assessments.

A Marine Corps Mission Need Statement (MNS) was written and the Army leadership restructured the program and the relationship of the contractors.

Weapons

Projects and Objectives.

Advanced Lightweight Ground Weaponry (ALGW). The focus of this project is the integration of emerging technologies that will increase the lethality, range, accuracy, and

overall operational effectiveness of ground combat elements of the MAGTF. Key technologies for integration include improved ballistics, advanced energetic materials, lighter composite materials, improved sighting systems, and improved stabilization systems.

Major Accomplishments.

ALGW. New start for FY97.

Combat Service Support

Projects and Objectives.

Advanced Amphibious Logistics/Combat Service Support (AAL/CSS). The AAL/CSS ATD project is directed toward the enhancement of all transport and tracking requirements in support of naval expeditionary warfare. Methods to improve visibility and tracking of supplies and equipment in transit, in storage, or during the maintenance cycle are being explored. In addition is the pursuit of development and demonstration of expeditionary engineering technologies (e.g., new family of air transportable, multiuse cranes and bridging systems) to enhance MAGTF expeditionary engineering.

Major Accomplishments.

AAL/CSS. The main thrust of recent project efforts has been the demonstration of Recording and Tracking Technologies (RTT) using a family of radio frequency (RF) tags to provide accurate in-transit and total-asset visibility of supplies and equipment, both in garrison and during expeditionary operations, down to a level sufficient to determine readiness status and anticipate sustainment requirements for the force.

Command and Control

Projects and Objectives.

Joint Tactical Communications (JTC). The JTC ATD project is focused on demonstrating the ultrawide band digital impulse radio technology to meet future voice, data, and signaling requirements (i.e. digitization of the battlefield). This system is designed to take advantage of the Low Probability of Intercept (LPI) and Low Probability of Detection (LPD) characteristics of signals within the solar-blind, ultraviolet (UV) region and the extremely high frequency (EHF) oxygen absorption region of the electromagnetic spectrum. This technology provides for clandestine, wide band communication. The JTC ATD project is joint with the Army and other efforts include monitoring of other Service and agency programs.

Integrated Combat Operations Center (ICOC). The ICOC project is a joint ATD to support streamlined Command and Control (C2), enhanced situation awareness, and rapid

decision making on future battlefields. These efforts involve multi disciplinary technologies to include: psychological, biological, and expert systems and computer visualization and facilitation of high cognitive plane mental and intuitive processes. These technologies will lead to an increase in situation awareness and more rapid decision taking by the field commander. The technical approach will exploit current research and development efforts within government, industry, and academia and, where necessary, new S&T efforts will be initiated to support capability requirements.

Major Accomplishments.

JTC. The Initial Phase of Ultra-Wideband (UWB) tactical Electronic devices (UTED) contract for Systems Engineering and Analysis and Study for UTED Low Data Rate (LDR) device was completed 19 October 1995. Option I of the contract was to develop, test, and fabricate sixteen LDR units. This was awarded 21 November 1995. The Preliminary Design Review (PDR) for LDR device and demonstration of ultra-wideband pulse technology was held at MARCORSYSCOM, Quantico, Virginia on 30 November 1995. The first Program Review was held for Joint Service Community (Working Group) at MARCORSYSCOM, Quantico, Virginia on 28 February 1996. the PDR for High Data Rate (HDR) device and second Working Group meeting was held at Time Domain Systems, Inc., Huntsville, Alabama on 27 March 1996.

ICOC. Participation in requirements generation for a reengineered USMC Regimental Combat Operations Center (COC) and development of a functional list of Situation Awareness software to support the reengineering of the COC was accomplished as well as generation and distribution of a script for the 4th Quarter FY96 Concept Demonstration. A software development lab in the (RLBTS) facility at NRaD was established and coordination with the CWL to support the demonstration of the Sea Dragon Concept took place.

Training and Education (T&E)

Projects and Objectives.

Team Target Engagement Simulator (TTES). The objective of this ATD is the demonstration of a core technology that allows individuals and small units to train in a synthetic battlefield as a supplement and complement to standard field and range training. The TTES will particularly enhance combat readiness for mid- and low-intensity conflicts with a focus on Military Operations in Urban Terrain (MOUT). The immediate technology goal is to create an appropriate synthetic environment in which individuals can participate in force-on-force engagements involving hostile and neutral personnel. The primary focus is on environmental and behavioral representation technologies, both of which have been reinforced by a Defense Modeling and Simulation Office (DMSO) award of reinforced funding. Advanced Distributed Interactive Simulation (DIS) technology is being employed.

Joint Modeling and Simulation (M&S). The joint M&S ATD program will develop the environmental features that support advanced training devices and virtual

prototyping particularly in the littoral battlespace. Development of constructive and virtual representations of dynamic environmental and human features will be required at a level of resolution sufficient to depict individuals and squads. Technologies will be developed to support capabilities to train while deployed and to conduct mission planning and rehearsal. This project will respond directly to the Marine Corps M&S Master Plan. M&S efforts will be implemented to fully integrate Marine Corps technology products with the DoD sponsored Joint Mine Countermeasures Advanced Concept Technology Demonstration (ACTD).

Major Accomplishments.

TTES. An evaluation suite for the TTES trainer was developed at Naval Air Warfare Center Training Systems Division (NAWCTSD). It involves an advanced graphic generator, a rear screen projection and display system, a foot pad for trainee interface and an instrumented M-16A1. A first generation prototype was fabricated. Quantico Combat Town has been rendered using multi-gen for the synthetic urban battle area. (JACK)-based icons, controlled by the computer and the trainee, move about the battle area. Two trainees are currently networked using the DIS protocols. The evaluation suite will be utilized to assess the dynamic synthetic environment under development.

Joint M&S. New start for FY97.

SUCCESSFUL TRANSITIONS

The ultimate objective of the ATD program is to transition the latest technology to an already fielded system or insert that technology into the design and specification of a system being developed. The AWT Directorate, using the ATD process, has successfully transitioned technology developed in a variety of areas within eight 6.3 projects to systems under development and managed by a PM. Three of the transitioned technologies support Maneuver, two support Firepower, and three support CSS.

Maneuver

Airborne Mine Detection and Analysis System (AMDAS). This mine detection technology transitioned to other Navy, Marine Corps, and Army ATD projects.

Distributed Explosive Mine Neutralization System (DEMNS). This MCM technology transitioned to the Joint Standoff Mine field Breacher (SMB) program.

High Water Speed Technology Demonstrator (HWSTD). This mobility and survivability technologies developed in this ATD project primarily transitioned to the Advanced Amphibious Assault Vehicle (AAAV) program and supported a MS I decision. However, some of the developments in technology transitioned directly to fielded systems some of which included:

a. Armor Applique Kit for AAV7A1

b. Enhanced Armor Applique Kit for AAV7A1

c. Armor Upgrade for LAV and Marine Corps Security Forces

d. Water jet propulsion for Combat Rubber Raiding Craft

Lightweight Plastic Heat Exchanger. This lightweight cooling system technology transitioned to other Navy, Marine Corps, and Army ATD projects. The Lightweight Plastic Heat Exchanger can be used to replace heavy, high maintenance metal heat exchangers. Both liquid-to-liquid and liquid-to-air exchangers have been demonstrated using a wide range of working fluids, temperatures and pressures. Typical weight savings for the plastic exchangers are 70% for liquid-to-liquid exchangers and 50% for liquid-to-air exchangers. Liquid-to-air radiators have been built and tested for several military vehicles such as the HMMWV, the Army's M 939 5-Ton Truck, and the USMC's Logistics Vehicle System (LVS). Plastic liquid-to-liquid heat exchangers have been built and tested for amphibious vehicle cooling systems and marine propulsion applications. Each PM responsible for these vehicles, as well as other like systems, has funded the testing portion of the evaluation and is interested in incorporating this new technology into their systems with either re-manufacturing programs or pre-planned product improvements.

Firepower

M-16 A2. Transitioned to a fielded system.

Shoulder-launched Multipurpose Assault Weapon (SMAW). Transitioned to a fielded system.

FO/FAC. Transitioned FO/FAC technology to PM Ground Weapons and re-named program to Target Location Detection and Handoff Systems (TLDHS). AWT will complete EUTs in FY96.

Combat Service Support

The technology from all three of these projects transitioned to joint acquisition programs.

Lightweight Integrated Suit Technology (LIST). This project provided the FMF with improved protection against Nuclear, Biological and Chemical (NBC) agents while reducing the bulk, heat stress, and logistical burden by combining environmental and chemical protection. The LIST project used two concepts: (1) layering techniques using undergarments, vapor protective combat uniform, and outer garment to protect against vapor, liquid, and aerosol agents; and, (2) an all-in-one protective suit to protect against vapor, liquid, and aerosol agents.

The technology approach included surveying the world for NBC garment materials and technology. Materials selected included French compressed foam, British nonwoven material, German carbon spheres, and Japanese flocked fibers.

Three wear tests of fifteen days each were conducted at Camp Lejeune and Camp Pendleton utilizing a total of 500 Marines. Live agent tests were conducted on swatches of material for down selection of concepts. The project became joint with all services and transitioned to PM Soldier System Command (SSC) as Joint List (JLIST) on 29 April 1993.

Lightweight Standoff Chemical Agent Detector (LSCAD). This project provided the FMF with a small, lightweight, stand-off chemical agent detector that can be used from a variety of tactical platforms. While on-the-move, the LSCAD can detect chemical agents up to five (5) km.

The detector developed under this project is small (less than 0.5 cu. ft.), lightweight (less than twenty (20) lbs), and will detect chemical agents in real time, during all-weather, day/night amphibious operations, raids, and assaults. This capability allows the Marines tactical mobility for operations in a chemical environment.

The detector was successfully tested: in the HMMWV based Nuclear Biological Chemical Reconnaissance System (NBCRS); aboard a commercial UAV; and, aboard a UH-1 helicopter operating at speeds up to 80 knots at stand-off distances of up to 5.0 km.

The project was transitioned to the PM SSC on 19 October 1993 for further development including testing aboard the Pioneer UAV.

NBCRS. The objective of the NBCRS project was to design and demonstrate a Marine Corps reconnaissance system utilizing a suite of NBC detectors mounted on a HMMWV platform. The Marine Corps leveraged this project from a similar Army program that utilized an expensive and heavy Fox vehicle that was not helo-transportable nor did it have fast-attack sensors and monitors. The Fox vehicle also did not match other U. S. vehicle silhouettes which would have made combat ID more difficult.

The Marine Corps NBCRS concept featured a suite of detectors such as: LSCAD, vapor detection (ACADA), German Mass Spectrometer (GEMS), real-time agent analysis (CBMS), Automatic Warning & Reporting System, Biological Analysis Module (BAM), automated surface sampling system, contamination marking system, surface contamination monitoring (CAM), sampling and detection kits, Individual Chemical Agent Detector (ICAD), collective protection system, communications MET sensor system, navigation system, and nuclear detection.

The output from the suite of detectors were all routed through a Systems Integration Unit (SIU) (computer) to rapidly detect, analyze, and identify NBC agents and automatically send the information to C2.

The System was successfully demonstrated at Camp Lejeune and the concept transitioned to PM SSC on 16 January 1992. It is anticipated that 44 units will be built: 22 on HMMWV chassis and 22 units on LAV chassis.

Command and Control

Command and Control in the year 2000 (C2-2000). This project demonstrated the advantages of developing and operating a single, open system architecture to support the operations of numerous C2 systems currently fielded, or in development, in support of MAGTF operations. This program displayed the advantages to be gained in operational effectiveness and system maintainability when a common hardware and common software environment is employed. This open system architecture was designed to be compatible with the Naval Tactical Command System - Afloat (NTCS-A) and is intended to be operable with the Army and Air Force tactical C2 systems.

Korean English Language Translator (KELT). In FY96 there has been additional development of the multilingual architecture, the recognition models, the software environment, and the speech recognizer. The MCTSSA has begun evaluating KELT Multilingual Phrasebook (KMP) for transition, and the FSSG has been identified to conduct a user evaluation. In addition, Defense Information Systems Agency (DISA) recommended KMP to the Military Communications Electronics Board Interoperability Improvement Panel for early fielding.

FY97 ATD's

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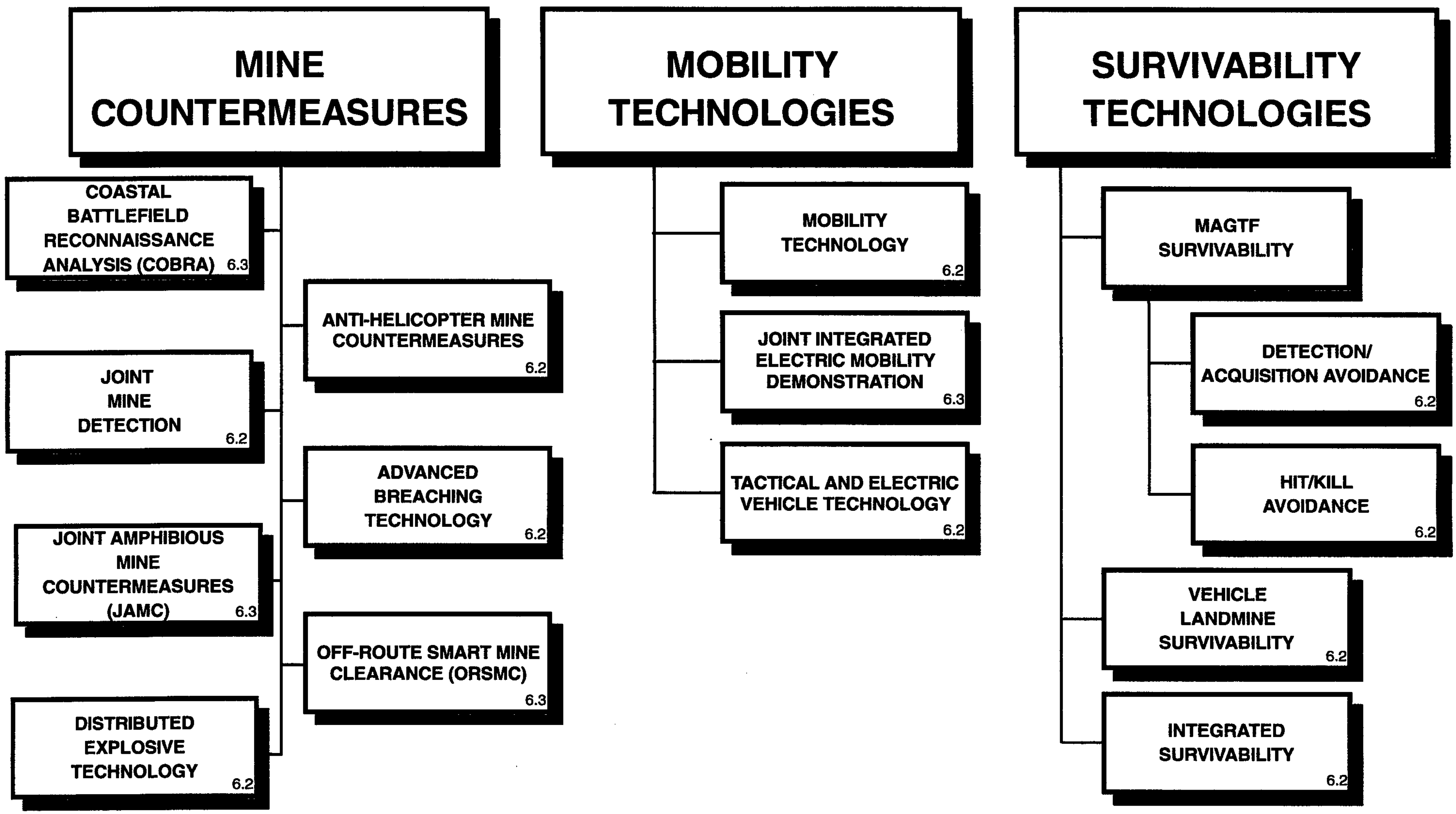
MANEUVER IMPERATIVE



NOTE: SEE 6.2 PLAN FOR ALL 6.2 PROJECTS.

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Imperative Title: MANEUVER

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ATD 1. COASTAL BATTLEFIELD RECONNAISSANCE AND ANALYSIS (COBRA)

Problem/Deficiency/Opportunity

The Marine Corps has both an urgent and continuing need for the capability of remotely performing beach reconnaissance for mobility and maneuver assessment. The detection of all types of land mines during operations from the very shallow water/surf zone to inland is critical. A system is needed to detect mines over areas to be entered by tactical units at a rate that will not impede mobility, and in a way that personnel will not be exposed to undue risk. This capability, if developed, will also support Navy and Army doctrine.

Technical Objectives/Expected Payoffs

The objective is to demonstrate, in an operational environment, a system incorporating advanced multispectral video sensors into an Unmanned Aerial Vehicle (UAV) to achieve capabilities for coastal reconnaissance of the beach area, Craft Landing Zone (CLZ), and inland. This system will image obstacles, fortifications, vehicles, mines, and mine fields prior to and during an amphibious assault and land combat operations. It will provide for automatic detection and location of mine fields in near real time. Providing the means to complete the reconnaissance and analysis of coastal battlefield areas such as Landing Craft Air Cushion (LCAC) landing areas, CLZ, and inland areas from a UAV will maximize the use of obstacle and mine clearance assets and minimize casualties.

The COBRA program will demonstrate the successful utilization of the analysis of multispectral imagery remotely collected from an UAV during coastal battlefield reconnaissance prior to an amphibious assault and land combat operations. While detection of obstacles, fortifications and vehicles, and terrain analysis are natural benefits of the analysis of multispectral imagery, the main emphasis will be on the development of a system which automatically detects and locates mine fields, thus meeting a much needed operational requirement.

There are five specific capabilities to be demonstrated:

a. Ground station processing for automatic mine field detection and location.

b. Capability to determine mine field and obstacle location utilizing onboard Differential Global Positioning System (DGPS) and aircraft altitude, heading, roll, and pitch.

c. Detection of above/on ground and limited buried mine fields in representative types of terrain that could be encountered in a coastal battlefield environment.

d. Day operation using passive and multispectral electro-optic sensing technologies.

e. Real time sensor tracking utilizing a limited video down link with map/image track overlay capabilities.

Technical Background and Approach

An applied research (6.2) program, SMDG, has been conducted at Naval Surface Warfare Center Dahlgren Division (NSWCDD), Coastal Systems Station (CSS). SMDG transitioned to the 6.3 COBRA program during which the focus shifted from a ground based sensor to an air platform sensor.

The technical approach will be to use the Pioneer UAV as a test platform to mount the multispectral video sensors. The UAV sensor development effort and the extensive image processing development effort required for automatic target detection will build on sensor and processing technology developed in the Marine Corps' 6.2 mine detection program. The development will focus on modular sensor packages to permit simpler and less costly upgrades as sensor technology evolves and UAVs with larger payload capacity become available. The algorithm development will be modular to be able to run in near real time on the appropriate hardware.

Summary of Prior and Current Years' Work

In Fiscal Year (FY) 94 and 95, work was concentrated on building the airborne and ground station subsystems in accordance with the respective Critical Design Reviews (CDRs). Also, in accordance with the CDRs, the algorithms were developed for image coregistration and automatic mine field detection and location. The airborne subsystem, including a video down link, was integrated into a Cessna 172 which served as a surrogate UAV. During FY95, extensive Development Test (DT-0) was conducted at both Eglin Air Force Base (AFB), FL and Camp Lejeune, NC. The airborne subsystem was flown over mine fields in natural backgrounds such as shallow water, surf zone, beach, and inland environments to evaluate false alarm rates. The data from these tests is being processed and analyzed to produce statistical Receiver Operating Curves (ROC) for all of the testing variables.

Planned Work

The DT-0 data is planned to be fully analyzed early in FY96 and a detailed report will be written. The COBRA airborne subsystem will be integrated into a Pioneer UAV. Operational Testing (OT-0) of the Pioneer UAV based airborne subsystem will be conducted at Camp Lejeune, NC. The OT-0 test plan and analysis plan will be finalized and the testing will be conducted according to the plan. During OT-0, there will be demonstrations and evaluations of

the operational utility and effectiveness of the COBRA mine field detection system under representative operational and field conditions.

The appropriate program documentation will be prepared. There will be particular emphasis on the system specification. This specification must be technically sound based on thorough testing. Other tasks, as necessary, will be performed to ensure a successful Milestone I decision.

Transition Plan

The COBRA program has been a 6.3 Advanced Technology Demonstration (ATD) since beginning mid-year FY93 and will end in FY97. In FY97 it will transition to a Program Manager (PM) for the 6.4 Demonstration and Validation (DEM/VAL) phase.

Relationship to Other Programs

An advanced, tunable, multispectral camera is being developed under the 6.2 Joint Mine Detection Technology (JMDT) program. The JMDT program is investigating innovative ways to improve remote mine detection including technology and detection software. Liaison is maintained, as necessary, with other programs whose developments bear on mine detection. The Army is developing the Airborne Standoff Mine field Detection System (ASTAMIDS). The Army is carrying out a Technology Demonstration (TD) of a Mine Hunter/Killer. Several technologies are being demonstrated under the Close-in Man Portable Mine Detector ATD. Defense Advanced Research Projects Agency (DARPA) is conducting a Hyperspectral Mine Detection program. DARPA is also developing an array passive millimeter wave imager. The Air Force work in passive millimeter wave imagers and high frame rate cameras is also being monitored for potential use to the Marine Corps.

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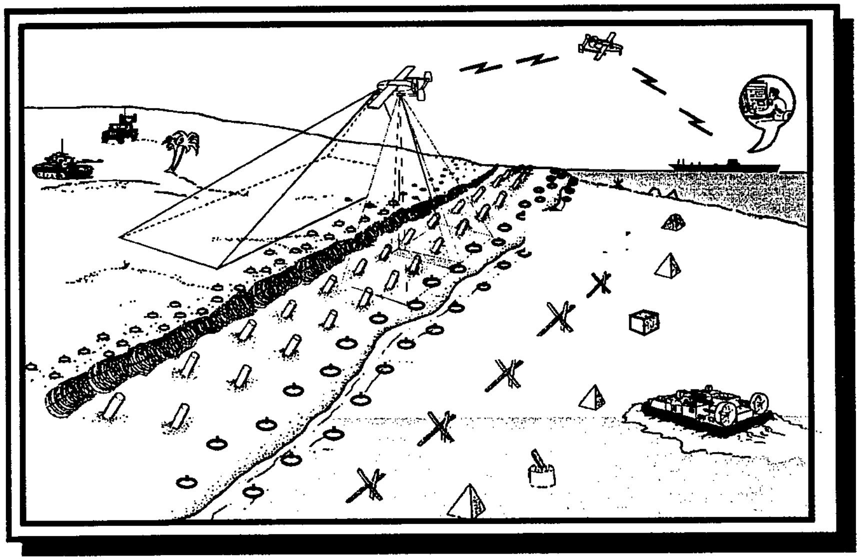
COASTAL BATTLEFIELD RECONNAISSANCE & ANALYSIS (COBRA)



OBJECTIVE:

- PROVIDE THE MAGTF THE CAPABILITY OF REAL TIME STANDOFF MINEFIELD DETECTION AND BEACH DEFENSE RECONNAISSANCE IN SUPPORT OF AMPHIBIOUS OPERATIONS

CAPABILITIES:

- COASTAL BATTLEFIELD RECONNAISSANCE AND ANALYSIS NAPDD
- SHALLOW WATER MINE COUNTERMEASURE RECONNAISSANCE AND DETECTION ORD
  - HIGH SEARCH RATE STAND-OFF MINEFIELD DETECTION
  - Pd=0.8, Pfa=0.3
  - NEAR REAL TIME PROCESS
  - DAY/NIGHT ALL Wx

APPROACH:

- INTEGRATE ADVANCED MULTISPECTRAL CAMERA INTO PIONEER UAV
- DEVELOP IMAGE PROCESSING TECHNIQUES TO SUPPORT AUTOMATED TARGET RECOGNITION (ATR)
- INTEGRATE VIDEO DOWNLINK COMPRESSION TECHNIQUES
- INTEGRATE LOW LEVEL ACTIVE ILLUMINATION CAPABILITY
- DEVELOP, TEST, AND INTEGRATE ADVANCED SENSORS AND OPTICS
- PARTICIPATE IN OSD JOINT COUNTERMINE ACTD

PERFORMERS:

- NSWC-PANAMA CITY, AAI, ERIM, MITRE

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
PIONEER INTEG	▲——▲			
OT-O		△		
ACTD DEMO I		△		
ACTD DEMO II			△——	——△
MILESTONE I				△

TRANSITION:

- PM-C4I

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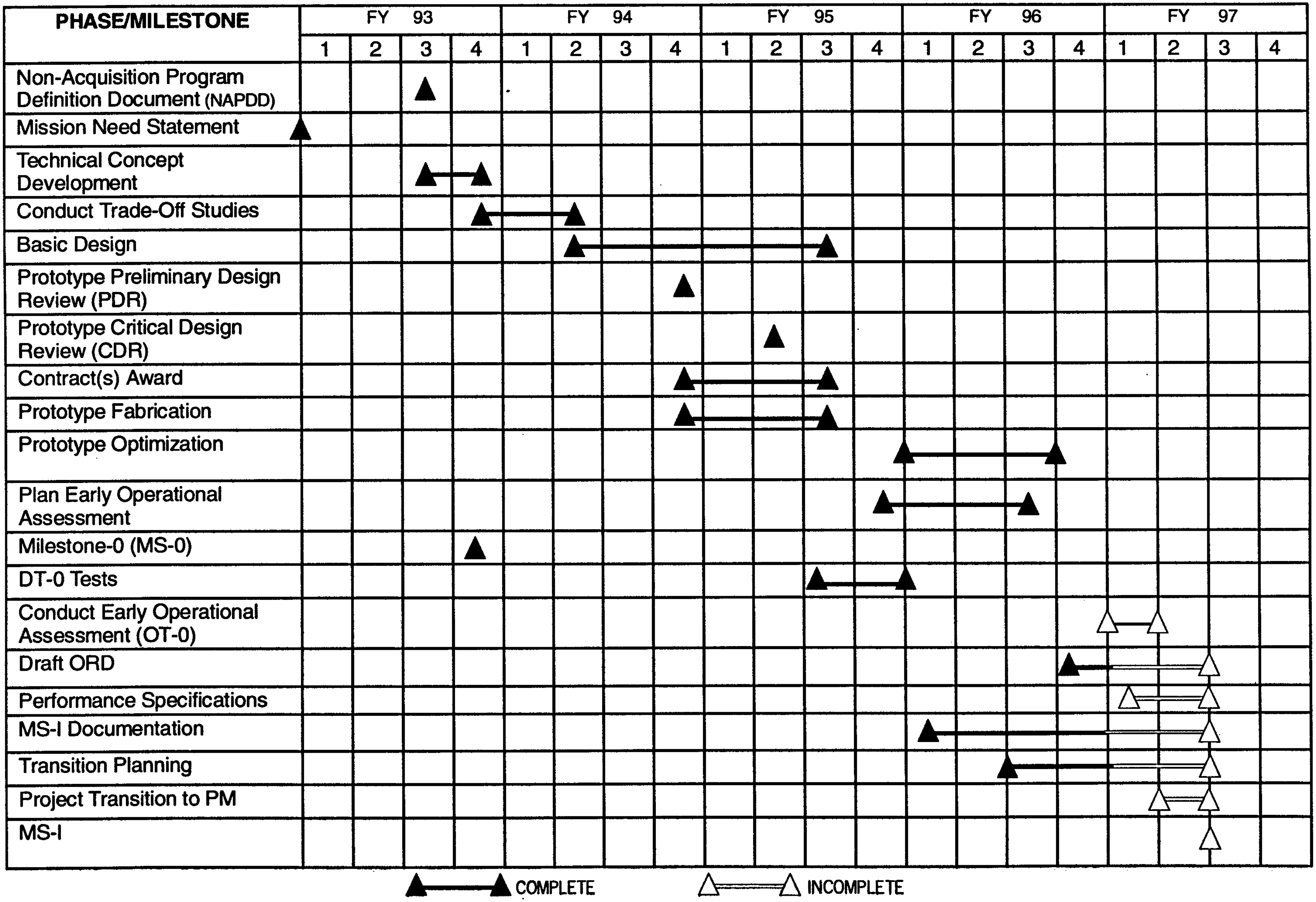
COASTAL BATTLEFIELD RECONNAISSANCE AND ANALYSIS (COBRA) ATD MILESTONES



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ATD 2. JOINT AMPHIBIOUS MINE COUNTERMEASURES (JAMC)

Technical Objective/Expected Payoffs

Objective. The JAMC ATD will demonstrate individual and integrated mine countermeasures (MCM) technical concepts to neutralize light obstacles and land mines in preparation for a vehicle mounted amphibious assault from the sea by the Marine Corps. The JAMC program is designed to provide a near term (5-15 years) fielded capability while a long term solution is developed for deployment beyond 15 years. JAMC will be used to clear the final portion of the amphibious assault lane from the transition area across the beach zone, and into the CLZ.

Payoffs. The JAMC system will be used to clear the final portion of the amphibious assault lane from the transition area across the beach zone, and into the CLZ as well as rapid follow on clearance to allow force build-up on the beach, and support for the initial movement inland. This supports the U.S. Naval expeditionary warfare concept of Operational Maneuver from the Sea (OMFTS).

Technical Background and Approach

Background. No systems or technical concepts for integrated clearance of mines and light obstacles during amphibious assaults are now fielded or under development. MCM systems to address this area in the far term are now being developed through the Navy Shallow Water Mine Counter-Measures (SWMCM) Program. In addition, there are a variety of technologies and systems currently fielded for clearing mines and obstacles on land and in the water. While none of these current mechanical, explosive or electro-magnetic systems was designed for the surf and beach areas, certain systems have a limited MCM capability in this unique operational area. These existing system technologies and selected other low risk technologies will provide the basis for development within the JAMC program.

Approach. To support the immediate need of a system fieldable within the near term, this program will develop mechanical, explosive and electro-magnetic MCM technical concepts and a suite of low risk technologies as well as optimizing existing technologies and integrating system(s) capabilities to provide a capability for countering the spectrum of threat mines and obstacles. Because operational situations are highly variable, a "toolbox" approach to overall system development will be taken. Individual subsystem and integrated system level testing will be combined with technical and operational modeling and simulation to allow definition of multiple technical concepts to support multiple operational scenarios, thereby deriving the best "toolbox".

Only those individual subsystem and system level technical concepts that can be fielded within the specified period will be developed. This ATD is streamlined to the point that the demonstration hardware should require minimal Demonstration and Validation (DEM/VAL) phase development before transition to the Engineering and Manufacturing Development (EMD) phase.

This approach will be carried out through development, testing and demonstration of a JAMC system model using the following developmental steps.

Technical concept development. Sub-scale hardware testing, modeling/simulation and analysis will be used to characterize the capabilities of each candidate technology. Candidate technologies will be chosen for further development in the next phase based upon comparative analysis. (There will be one or more technologies to cover each of the required functions of the overall system.)

Hardware design and fabrication. The chosen technologies will be developed and fabricated. This phase will include hardware system and sub-system design, testing, modeling/simulation, system analysis and comparative analysis (as required).

Testing and evaluation. The one or more selected technologies will be formally tested through DT and OT.

Demonstration. The one or more selected technologies will be demonstrated in an operational environment. This may be done as part of the OT.

System Integration. Integration will be done as required, beginning in the hardware design and fabrication phase, continuing through the Test and Evaluation (T&E) phase.

Risk reduction is a major component of all phases of the ATD.

Summary of Prior and Current Year's Work

To support the need of a system fieldable within the near term, major technical efforts have included: system concept development; system design and fabrication; platform integration; test and evaluation; and, demonstration.

Planned Work

Specific ATD and program milestones are provided in the enclosed milestone chart. The work in this ATD will be done within the structure described in Paragraph 1.2.2.b. The specific technical work areas are described below.

a. Explosive mine neutralization

(1) Explosives systems

(2) Deployment systems

b. Mechanical mine neutralization

c. Mechanical obstacle neutralization

d. Electro-magnetic mine neutralization

e. Cleared area marking systems

f. Remote control for platform and countermeasures systems

g. Sub-system integration

h. Platform survivability, optimization and system integration

I. Integration for system delivery

Modeling and simulation will be employed, where possible, for analysis, design, and system(s) integration, test, and evaluation. The culmination of the ATD will be the demonstration of individual subsystems and integrated systems in an operational environment utilizing several different scenarios. Additionally, capability of the systems and subsystems will be evaluated with modeling and simulation.

Transition Plan

A transition plan to support a FY96 transition to the Program Manager (PM) for Engineer Systems and a Milestone (MS) I/II decision will be prepared.

Relationship to Other Programs

a. JAMC supports the Navy SWMCM program by providing a near term MCM capability for the surf zone and beach area.

b. The basic explosive mine neutralization technology for the JAMC project is taken from the Marine Advanced Countermine System (ACS) program.

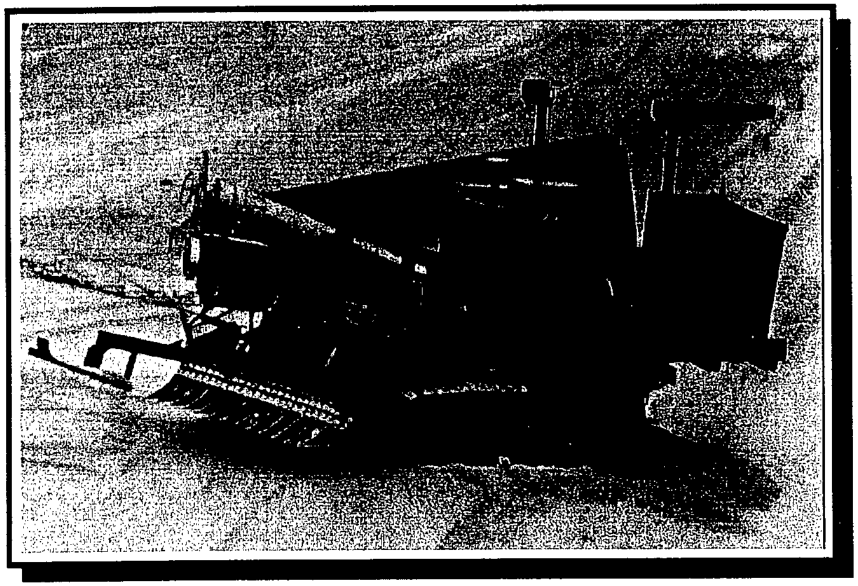
c. The basic magnetic signature duplication mine neutralization technology will be drawn from ongoing Army and Marine Corps programs.

d. The basic mechanical mine clearance technology will draw from fielded systems and development programs in the Army and Marine Corps.

e. JAMC is a component ATD of the Office of the Secretary of Defense (OSD) Advanced Concepts Technology Demonstration (ACTD) - "Joint Mine Countermeasures."

f. JAMC resources are augmented by funding from the Joint Surf Zone Mine Countermeasures (JSZMC) project.

JOINT AMPHIBIOUS MINE COUNTERMEASURES



APPROACH:

- DEVELOP SYSTEM LEVEL MCM "TOOL BOX" FOR MULTIPLE OPERATIONAL SCENARIOS
- INTEGRATE EXPLOSIVE, ELECTROMAGNETIC, MECHANICAL MCM TECHNOLOGIES WITH CONCEPTUAL TESTBED
- OPTIMIZE CURRENT MCM TECHNOLOGY WHERE POSSIBLE
- INTEGRATE, WHERE POSSIBLE, SEMI-AUTONOMOUS TECHNOLOGY TO PROVIDE CREW SURVIVABILITY
- PARTICIPATE IN OSD JOINT COUNTERMINE ACTD

PERFORMERS:

- NSWC/IH, WRIGHT LAB/TYNDALL AFB, TRACOR AEROSPACE, LOCKHEED-MARTIN

OBJECTIVE:

- ENABLE OMFTS BY PROVIDING THE CAPABILITY OF FORCIBLE ENTRY THROUGH BEACH DEFENSES BY CLEARING LANDMINES AND LIGHT OBSTACLES IN SUPPORT OF AMPHIBIOUS OPERATIONS

CAPABILITIES:

- SHALLOW WATER MINE COUNTERMEASURE ORD
- ASSAULT COUNTERMINE WARFARE MNS
- RAPID FOLLOW-ON MUNITIONS CLEARANCE CAPABILITY MNS
  - INTEGRATE WITH NAVY EMERGING SHALLOW WATER MCM SYSTEMS
  - 95% CLEARANCE
  - 50 x 150 M IN 1.5 HR

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
PIONEER INTEG	▲————	△		
OT-O	▲————	——△		
ACTD DEMO I		△		
ACTD DEMO II			△————	——△
MILESTONE I				△

TRANSITION:

- PM - CSS / ENGINEERS

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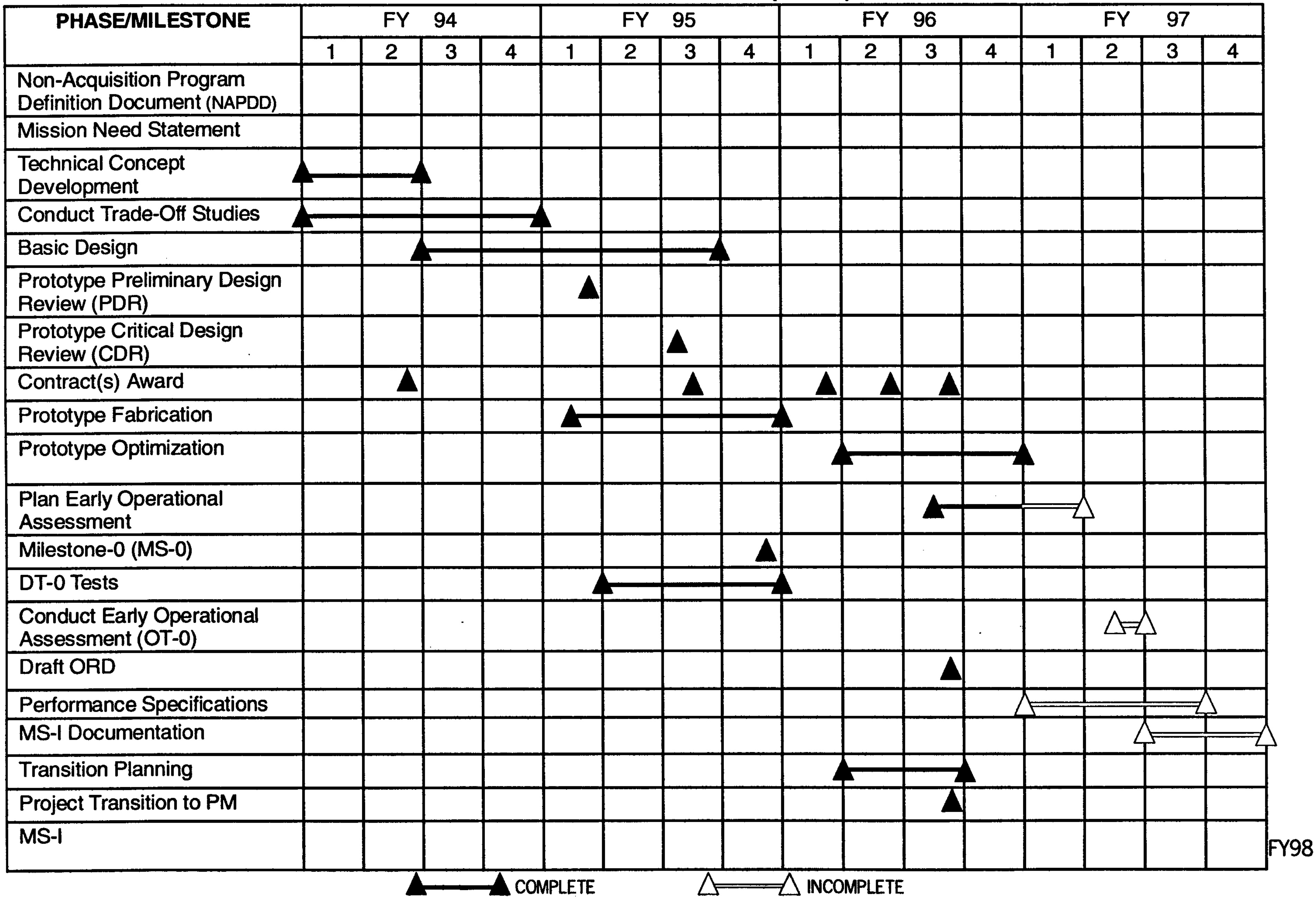
JOINT AMPHIBIOUS MINE COUNTERMEASURES (JAMC) ATD MILESTONES



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ATD 3. OFF-ROUTE SMART MINE CLEARANCE (ORSMC)

Problem/Deficiency/Opportunity

Current MCM capabilities are seriously deficient and can significantly impair littoral warfare operations as well as subsequent operations ashore. Lack of countermine and counter obstacle capability translates into limited maneuver, mobility, and survivability which further translates to lack of overall capability to conduct expeditionary force projection. The objective of this project is to develop, demonstrate, and transition for further development the technology necessary to provide Marine Corps Ground Combat Units and assault follow-on echelon (AFOE) units an advanced/enhanced capability to effectively conduct countermine operations in support of amphibious operations and subsequent operations ashore against the future threat. This effort includes Rapid Follow-on Clearance (RFC) and Explosive Ordnance Disposal (EOD) operations. Present mine neutralization systems rely primarily on explosive clearance techniques, physical removal of the mine from the vehicle's path, or a simple magnetic signature duplication. All of these neutralization systems rely on actuating the mine fuzing mechanisms or physical removal. Upgrades and changes to land mine fuzing (i.e. hardening) and the use of multiple sensor/actuation fuzing have seriously degraded the effectiveness of conventional mine clearing techniques. In addition, the revolutionary smart standoff mines with top attack munitions are capable of autonomously identifying and attacking targets from ranges of several hundred meters. Conventional MCM such as line charges, plows, rollers, and magnetic signature duplication are marginally effective against the current and emerging generation of mines.

The Marine Corps Long Range Plan and the Marine Corps Mid-Range Objectives Plan, Mission Area No. 214, Land Mine Warfare, state the need for MCM.

Technical Objective/Expected Payoffs

Objective. The objective of the ORSMC ATD is to demonstrate integrated countermeasures technologies that can neutralize off-route smart mine (ORSMs) at a safe standoff from the maneuver element and with minimum risk to operators.

Payoff. The payoff of the ORMSC ATD is that it will provide a mine breaching capability that does not exist with any equipment currently in inventory. The ability to clear ORSMs from avenues of approach will enhance the survivability of combat and support vehicles in situations ranging from heavy force breaching operations to lines of communication and main supply route maintenance.

Technical Background and Approach

Background. Advances in compact digital signal processing (DSP) technology have led to the development of a new family of land mines. ORSMs are autonomous, two-stage land mines that detect, identify, and attack vehicular targets from extended range. Two types of ORSMs are being developed.

The first type, commonly referred to as a "side attack mine," is hand emplaced at a standoff of 50 to 100 meters from a path. The ground platform of the mine passively "listens" for an approaching target using acoustic and possibly seismic sensors. Once a target is detected, the mine activates an infrared (IR) sensor system that stares across the path. When the target vehicle crosses the field of view (FOV) of the IR sensor, the mine launches a powerful unguided projectile towards the side of the vehicle.

The second type of ORSM, commonly called a "top attack mine," is also most commonly hand emplaced at a standoff of 50 to 100 meters from a road. The ground platform of these mines again passively "listens" for the approach of a target vehicle with acoustic and seismic sensors. The mine uses the acoustic signature from the approaching vehicle to classify its type and plot a fire control solution. The mine launches a sublet over the target. This sublet, typically with its own IR and/or millimeter wave (MMW) sensors, scans the ground below, detects the target, and attacks its more vulnerable upper armor with an explosively formed penetrator (EFP).

Because of their standoff capability and low densities on the battlefield, the ORSM threat will be difficult to detect and essentially invulnerable to conventional mine clearing equipment like plows, rollers, and line charges. The ORSM threat is a developing one. Enabling technologies are mature and available. There are many developing ORSM systems world wide with fielding dates as early as 1998. There are no known previous developments, domestic or foreign, addressing countermeasures to ORSM systems. A joint Marine Corps. System Command (MARCORSYSCOM) and Army Belvoir Research, Development and Engineering Center (BRDEC) 6.2 project successfully demonstrated technology capable of defeating the ground platform systems of these developing mines.

Approach. The ORSMC ATD builds upon the success of the joint Services 6.2 program in this area. The approach includes a complete analysis and simulation of the emerging threat, both ground platform and sublet alike, to identify its capabilities, limitations, and vulnerabilities. The ORSMC system uses deception techniques to cause the ORSM systems to reach erroneous fire control solutions and launch their sublets prematurely. To protect the ORSMC system from the sublets of these mines once launched, the ORSMC vehicle is treated with signature management materials to reduce its IR and MMW signatures. The ORSMC system is mounted in a tele-operated vehicle to protect the operators of the system . The evaluation of ORSMC performance is achieved by testing the system against a variety of surrogate ORSMs that possess all of the sensor and signal processing characteristics of the real threat systems in a safely instrumented configuration.

The development methodology can be further broken down into the following steps. This approach builds upon the findings of the 6.2 program. Conclusions from that phase of development are not reinvestigated by the ATD.

Assess sublet sensor capabilities. The basic functioning of ORSM ground platforms will be augmented with accurate simulations of side attack mine functions and top attack sublet functions. The complete suite of ground platform and sublet systems will be used to assess countermeasures performance at the subsystem and system levels and also to demonstrate ORSMC capabilities.

Migrate to more capable host vehicle. The mobility of the ORSMC system will be improved by migrating development onto a High Mobility Multi-purpose Wheeled Vehicle (HMMWV) test bed. This will also facilitate integration of the ORSMC system with existing tele-operation technology currently being developed for HMMWVs.

Develop signature management requirements. Testing of side attack sensor systems and sublet sensor systems will identify requirements for ORSMC system shape and material properties that will ensure a LPD. These thresholds will be used iteratively to design the ORSMC signature management suite.

Design and fabricate system hardware. Constraints on ORSMC geometry of the signature management suite, improvements to component accessibility and contaminant control, remote control considerations, and the manageability of the size of system sections will all be used to drive the final design of the ORSMC system. The design process will be performed iteratively with some testing to ensure all exit criteria are met. The design will be presented for approval before final fabrication of the ATD demonstrator sets begins.

Test and evaluate component and system performance. Testing will involve an iterative series of Government and contractor testing. Several operational tests will be performed as part of Army demonstrations. System subassemblies will be tested for individual performance. System level demonstrations will be conducted.

Integrate final systems for demonstration. Two to four final operating sets of the ORSMC system will be integrated for demonstration and further operational testing. The number will depend on resources in the final year of the ATD and the requirements for participation of the system in both Army and Marine Corps demonstrations.

Demonstrate system capabilities. The ORSMC system will be coordinated to participate in a range of high level, joint service demonstrations. Feedback from these events will be used as OT data to justify continued development.

There are some major technical challenges and force structure issues that ORSMC must overcome during the course of this ATD.

Signature management. Smart mine systems have proven to be very sensitive devices in the IR arena. This poses a significant challenge for ORSMC systems. Innovative designs and materials are under development to meet exit criteria in this area. Compromises between the placement of different ORSMC subsystems on the host vehicle will need to be reached.

Tele-remote operation. Tele-remote operation in a combat environment is controversial. The focus for the ORSMC ATD will not be to resolve this issue but rather to use the accepted tele-remote doctrine to protect ORSMC system users. The ORSMC system will implement a line-of-sight (LOS) tele-remote capability that will completely control all system functions for the ATD.

Operational concept. ORSMC placement in the force structure will be assessed during the course of the various demonstrations and operational tests that will be performed and also as part of the ORSMC modeling and simulation effort.

Platform integration. Placement of all subsystems onto a single small vehicle is a considerable engineering effort. Most subsystems have some requirements that are in open conflict with those of other subsystems. Integrated Product and Process Development (IPPD) practices for concurrent engineering will be applied to ensure maximum interoperability between all subsystems.

Available technologies will be leveraged as much as possible. The ORSMC program is now resident in the Camouflage, Concealment, and Deception Branch of the Night Vision and Electronic Sensors Directorate. As such, it is in a position to leverage a vast array of state of the art developments in signature management materials and techniques being made by associated programs. The ORSMC project is aligned with the Joint Project Office (JPO) for Unmanned Ground Vehicles and Systems in order to leverage their tele-remote systems for HMMWVs. These systems are the most likely systems to be fielded and supported by the Army over the next several years.

Extensive modeling and simulation of the ORSMC system, careful concurrent engineering practices, and regular dialog with user and user representatives is being used by the ORSMC ATD to minimize development risk. Most technologies used in the ORSMC system are, in one form or another, commercially available. This lowers the technical, schedule, and cost risk of the program considerably. Of higher risk are the signature management components of the system. Close coordination with leading projects in signature management are controlling these risks.

Summary of Prior and Current Year's Work

In FY94 and FY95, the ORSMC ATD made significant progress toward meeting its technical goals and exit criteria. The ORSMC system was successfully migrated to a HMMWV test bed. Improvements in the quality of the acoustic signature were made. The baseline

tele-remote capability was installed and tested for the HMMWV and ORSMC. All vehicle driving functions worked successfully. ORSMC system control functions worked well but more development is required. Maneuverability issues with the seismic source were addressed with a redesign of the system to provide a raised position for the device that allows for easy transport. Two generations of signature management suites have been designed and tested. Each iteration was an appreciable improvement over the earlier design. The final configurations for the ATD are nearly complete. Two IR decoy systems, needed to defeat the side attack ORSM, have been fabricated and tested. The better performing system will be used for the ATD demonstrations. Efforts are ongoing to model the ORSMC system in (CASTFOREM). CASTFOREM is an event sequenced, stochastic simulation of a force on force encounter. Smart mines and the ORSMC system have been introduced into this environment and experiments with doctrine and tactics have been conducted. Additional modeling and simulation for incorporation of the ORSMC system into Defense Information Systems Agency (DIS) is underway. The ORSM simulators have been upgraded to include a complete side attack simulator and a complete top attack simulator. Only a few more modifications of these smart mine simulators remain to be made.

Planned Work

Consistent with the approach defined in previous sections, the ORSMC ATD has only to complete the final few steps.

Integrate Final System. Late FY95, early FY96, testing of the ORSMC system confirmed the correct operation of each subsystem or identified the last remaining adjustment necessary for correct operation. The final configurations of these subsystems will be briefed to technical, management, and proponent representatives in early FY96. The final ORSMC system configuration will be used to integrate the final number of systems on HMMWV platforms for joint service testing and demonstration.

Smart Minefield Simulator Completion. The top and side attack smart mine simulators have been in constant use during the ORSMC system testing program. Final forms of these systems in the necessary numbers will be built for use in instrumenting joint Service demonstrations and for test and evaluation in later phases.

Demonstrate System Capabilities. Constant coordination has been maintained and is ongoing to place the ORSMC system into several joint Service high level technical demonstrations. In late FY96, the ORSMC system will participate in the Dismounted Battle Lab Warfighting Experiment "Light Fighter". The ORSMC system will participate in the Department of Defense (DOD) sponsored Joint Countermine ACTD I in FY97 and ACTD II in FY98. The ORSMC system is also planned for inclusion in the Dismounted Battle Lab Warfighting Experiment "Movement to Contact" in FY98.

Modeling and Simulation. Assessment of the ORSMC system utilizing existing and experimental tactics will be performed using DIS, Force Model "LLNL" (JANUS), and

CASTFOREM. These simulations will help identify optimal ORSMC system position in the force structure for the various demonstrations to be performed.

Transition Plan

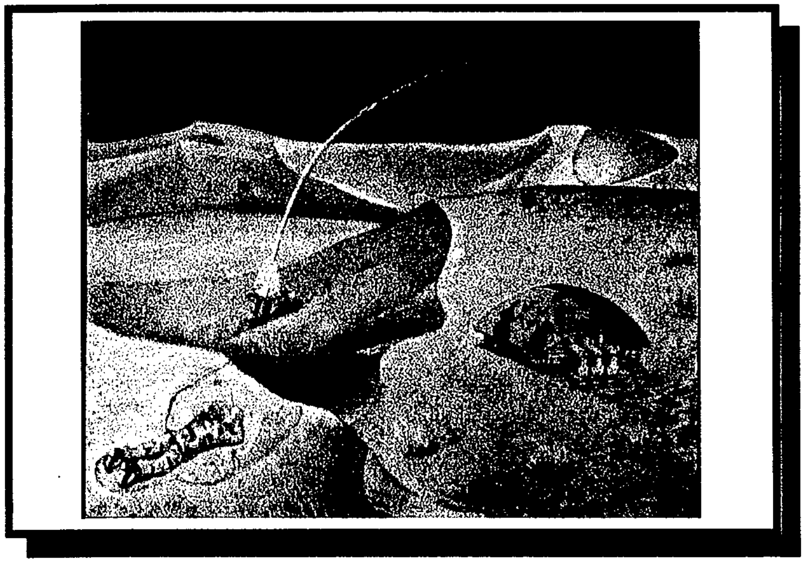
A transition plan will be prepared to support a first quarter FY97 transition of ORSMC technology to the PM for Mine, Countermine, and Demolition (MCD). The DEM/VAL phase will be a formal, joint Army/Marine Corps program with the Army as lead service.

Relationship to Other Programs

a. The ORSMC ATD is a component of the OSD ACTD - Joint Mine Countermeasures.

b. The ORSMC system is a participant in the Army Dismounted Battle Lab Warfighting Experiment "Light Fighter."

OFF-ROUTE SMART MINE CLEARANCE (ORSMC)



OBJECTIVE:

- OMFTS CAPABILITY AT RISK
- NEED CAPABILITY TO NEUTRALIZE OFF-ROUTE SMART STANDOFF MINES (ORSM) IN ALL ENVIRONMENTS AND OPERATIONAL SCENARIOS
- NEED "INSTRIDE" NEUTRALIZATION CAPABILITY
- ENHANCES OVERALL FORCE MOBILITY AND SURVIVABILITY FOR HEAVY AND LIGHT FORCES

CAPABILITIES:

- STANDOFF MINE COUNTERMEASURES CAPABILITY MISSION NEED STATEMENT

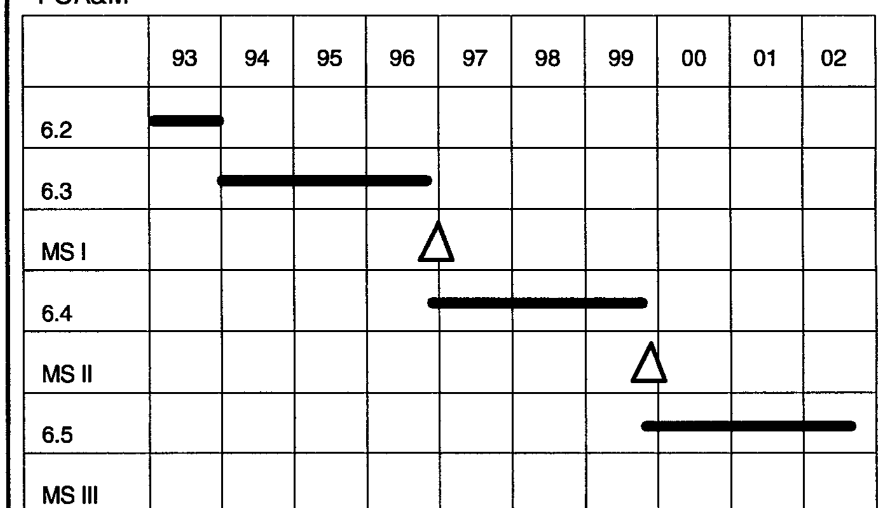
APPROACH

- DEVELOP TECHNOLOGIES AND CONCEPTS TO NEUTRALIZE CURRENT AND FUTURE ADVANCED, WIDE AREA TYPE LANDMINES IN ALL ENVIRONMENTS AND OPERATIONAL SCENARIOS
- ACTIVE COUNTERMEASURES BY SIMULATION OF VEHICLE SIGNATURES AND/OR ACTIVE COUNTERMEASURES
- SEISMIC, ACOUSTIC, MAGNETIC, RF SIGNATURES
- UTILIZE LOW OBSERVABLES TECHNOLOGY
- DEMONSTRATE IN FIELD ENVIRONMENT
- INCLUDE IN HIGH LEVEL OPERATIONAL DEMOS AND EXPERIMENTS

PERFORMING ACTIVITIES

- BRDEC, FT. BELVOIR
- SANDIA NATIONAL LABORATORY
- WES, VICKSBURG, MS
- ALLIANT TECH SYSTEMS

POA&M



PROSPECTIVE PM - SSE/ARMY ENGINEERING SYSTEMS
IOC - FY 04
JOINT USMC/ARMY PROGRAM

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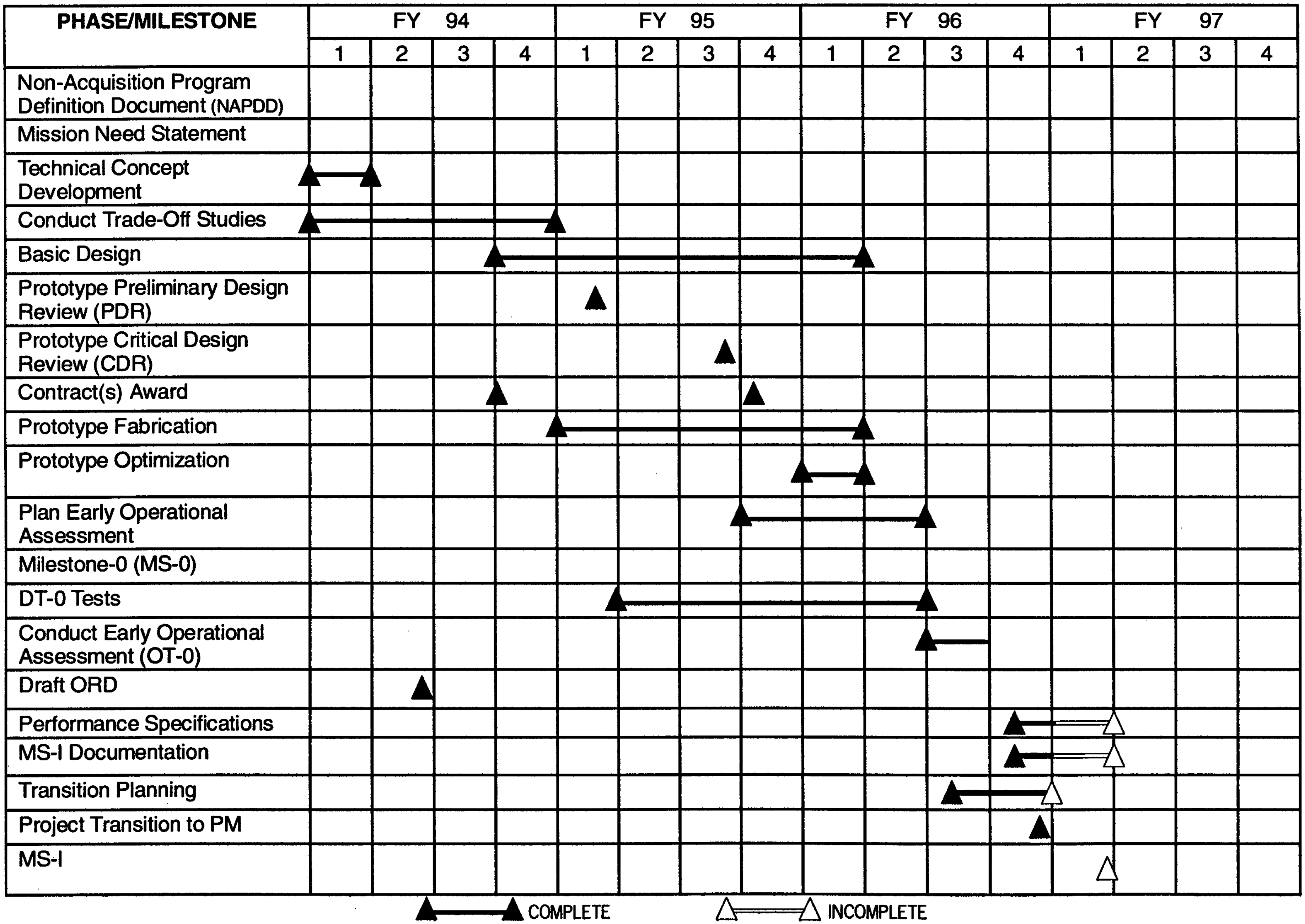
OFF-ROUTE SMART MINE CLEARANCE (ORSMC) ATD MILESTONES



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ATD 4. JOINT INTEGRATED ELECTRIC MOBILITY DEMONSTRATIONS (JIEMD)

Problem/Deficiency/Opportunity

The evolving cornerstone of Marine strategic and tactical doctrine is maneuver supported by fire. The mobility required on future battlefields to support the maneuver aspect of this doctrine against increasingly mobile and lethal adversaries promises to demand greater capability and flexibility from our combat and tactical vehicle fleets.

Future propulsion systems will continue the need to be as light as possible in order to promote strategic mobility and, concurrently, as powerful as possible in order to meet the foreseen tactical requirements.

Emerging developments in the field of electric power systems offer a great number of advantages in design, production, and maintenance of vehicles. The JIEMD ATD project intends to exhibit the capabilities of those emerging technologies in a series of demonstrations and on a variety of test beds. These operations will include the development and demonstration of assorted hybrid electromechanical drive systems, all electric systems, innovative suspensions and drive trains, power sources, and water propulsion systems. A major payoff will be much more survivable electric armors and vetronics through total vehicle electric power integration.

Technical Objective/Expected Payoffs

Working within the tenets of the OMFTS concept, future Marine Corps platforms must be more capable in terms of mobility, lethality, survivability, and supportability. On board vehicle systems will be required to operate at efficient power and energy levels so as to have minimal logistic impact on deployed forces. Existing mechanical, hydraulic, and electrical systems, to include drive trains, in combat and tactical vehicles are inefficient in operation across a broad range of mission needs. Most subsystems are individually developed first and packaged in vehicles later usually in a non-efficient manner for total system suitability. This program focuses on development of advanced platforms and subsystems that most efficiently meet operational requirements. Addressing vehicle design from a system perspective, this program focuses on future platforms and mobility technology predominantly in the areas of electric power generation, power transfer, energy storage, and propulsion systems.

Technical Background and Approach

Utilization of electric power, electrochemical storage, and electromechanical storage devices offers the most efficient means to generate and share electric power on board military combat vehicles that have varied missions. Mobility, survivability, and lethality systems all

require power in various forms and duration for the conduct of military missions. Defining vehicle requirements, subsystem technical requirements, mission scenarios, and vehicle configurations will allow for a more efficient and optimized vehicle design that can take advantage of future technologies. This will also allow the identification of future capabilities that can be exploited.

Today's combat vehicles combine hydro-mechanical drivetrains, auxiliaries that are electrically based, pneumatic control systems, and hydraulic accessories that operate at various pressure ratings. Advanced electronic, optronic, and directed energy systems will all require greater use of on board electric power. The commercial industries in mobile platforms, and in utility and commercial power generation and distribution, are advancing the development of electric components which have application for military vehicles. These industries are taking advantage of electric power management to improve efficiency and performance and to reduce cost. These same capabilities and payoffs are being applied to combat vehicles within this program.

Summary of Prior and Current Year's Work

Efforts in FY95 focused on the definition of future vehicle needs, characteristics, and stated capabilities to fulfill anticipated OMFTS requirements. Multiple vehicle concepts were formulated and assessed against future scenarios of operation and postulated military missions and needs. Using several different evaluation techniques, four future vehicle systems were highlighted as those having most need to the Marine Corps in the future. Because these systems are different from currently fielded or planned Marine systems, they offer an opportunity to take advantage of new systems architectures.

FY96 efforts are focused toward an Expeditionary Logistics Transport Vehicle (ELTV), a Future Combat Vehicle (FCV), a Motorized Squad Carrier (helicopter transportable), and a Reconnaissance, Surveillance and Target Acquisition (RSTA) platform (helicopter transportable). The latter two system developments have been combined and will share a common platform chassis, the Reconnaissance/Scout Vehicle (RSV), with reconfigurable mission payloads depending on tactical employment. Several technology demonstration versions of an RSV type vehicle have been built exhibiting many operational aspects of the RSV mission. These vehicles will be used for future demonstrations and technology insertion and testbed platforms.

Planned Work

Each vehicle system will be characterized within the framework of future capabilities desired. Several concepts for each class of vehicle will be generated and evaluated for optimum performance and operational suitability in typical mission scenarios. These analyses will determine feasible major subsystem requirements by identifying potential risk areas requiring further investment. The analyses are also expected to result in suitable models to simulate the

conduct of mission related functions and tasks. Lessons learned from demonstrations and tests of previously built electric/hybrid electric vehicles will be leveraged into the JIEMD ATD process. Current trends and industry initiatives, along with future government technology development efforts and investment strategies, will be examined for potential application. Technology transfer and insertion will be leveraged heavily to ascertain the direction, shortfalls, and risks associated with electric propulsion and subsystem technologies.

Transition Plan

The ELTV will support combat service support initiatives within the Marine Corps and Navy with a mid-term transition planned. The FCV that has been identified will support the Marine Corps Future Light Combat Vehicle (FLCV) effort for which a Mission Need Statement (MNS) exists. The RSV is a joint program with the DARPA and the Special Operations Command (SOCOM). The Marine Corps has a requirement for a V-22 transportable Light Strike Vehicle (LSV) with an initial operational capability (IOC) requirement of the year 2000 while the SOCOM has a requirement for a V-22 transportable platform with an IOC requirement of the year 2002. It appears that the Marine Corps and the SOCOM will combine their requirements into a joint MNS and Joint Operational Requirements Document (JORD) and thus will benefit from the technology and platforms developed from this initiative. Each of the three (3) vehicle programs (i.e., ELTV, FCV, and RSV) will transition to their respective ATD initiatives in FY98.

Relationship to Other Programs

The DARPA is participating with the RSV program through electric power system technology from its electric vehicle/integrated hybrid electric power program. This program may also transition components to the FLCV program since the vehicle weight classes are similar. The Army has a Future Scout Vehicle (FSV) program that involves three classes of vehicles that are based on different transport requirements and missions. Developments in the RSV program may fulfill the requirements of the lightweight class FSV and discussions between the Army and Marine Corps are assessing the potential of a joint effort. The heavier class FSV may be compatible with the FLCV requirement and, again, the Marine Corps and Army are investigating a joint effort. The ELTV may have similarities with future Army/Navy cargo/lighterage vehicles such as replacements for the current Lighter Amphibious Resupply Cargo (LARC) class of vehicles. The extent of mutual or joint efforts in all programs are being discussed and should be defined in FY96.

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JOINT INTEGRATED ELECTRIC MOBILITY DEMONSTRATION

OBJECTIVE:

- DEVELOPMENT AND INSERTION OF ELECTRIC SUB-SYSTEMS TO IMPROVE VEHICLE PERFORMANCE, CAPABILITY AND DECREASE POL USAGE

CAPABILITIES:

- S&T ROUNDTABLE ISSUES BEING ADDRESSED:
  - INCREASE SHOOTER MOBILITY (G-Q2)
  - INCREASED SPEED AND RANGE (Y-Q2)
  - INCREASED PLATFORM EFFICIENCY (G-Q2)
  - MODULAR WEAPON / COMBAT SPT TRANSPORT (Y-QI)
- MNS FOR LIGHT STRIKE VEHICLE: "HIGHLY MOBILE, RELIABLE"
- ADDRESS CWL NEED FOR SMALL UNIT TEAM TRANSPORT, DEEP INSERTION AND EXTRACTION

APPROACH:

- JOINT PROGRAM WITH DARPA FOR APPLICATION TO USMC COMBAT AND TACTICAL VEHICLES
- STRONG DUAL-USE APPLICATION WITH COMPONENTS COMING FROM COMMERCIAL INDUSTRY
- DEVELOP/DEMONSTRATION FOR DIFFERENT CLASS VEHICLES:
  - LIGHT STRIKE PLATFORM - JTEV (2-3 TONS)
  - HYBRID ELECTRIC HMMWV (4 TONS)
  - AAV7A1 (30 TONS)
- TRANSITION TO FY98 JOINT-ATD FOR RECONNAISSANCE, SURVEILLANCE, TARGETING - VEHICLE WITH DARPA

PERFORMERS:

- NSWC-CARDEROCK, DARPA, ARMY
- UNITED DEFENSE, ROD MILLEN, CTC

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
JTEV DEMO	▲	△		
HYBRID HMMWV - FABRICATE	▲	△		
HYBRID HMMWV TEST/DEMO		△ △		
AAV7A1		△		
RST-V START			△	△

TRANSITION:

- JOINT RECON SURVEILLANCE-TARGETING VEHICLE ATD
- FUTURE LIGHT COMBAT VEHICLE ATD

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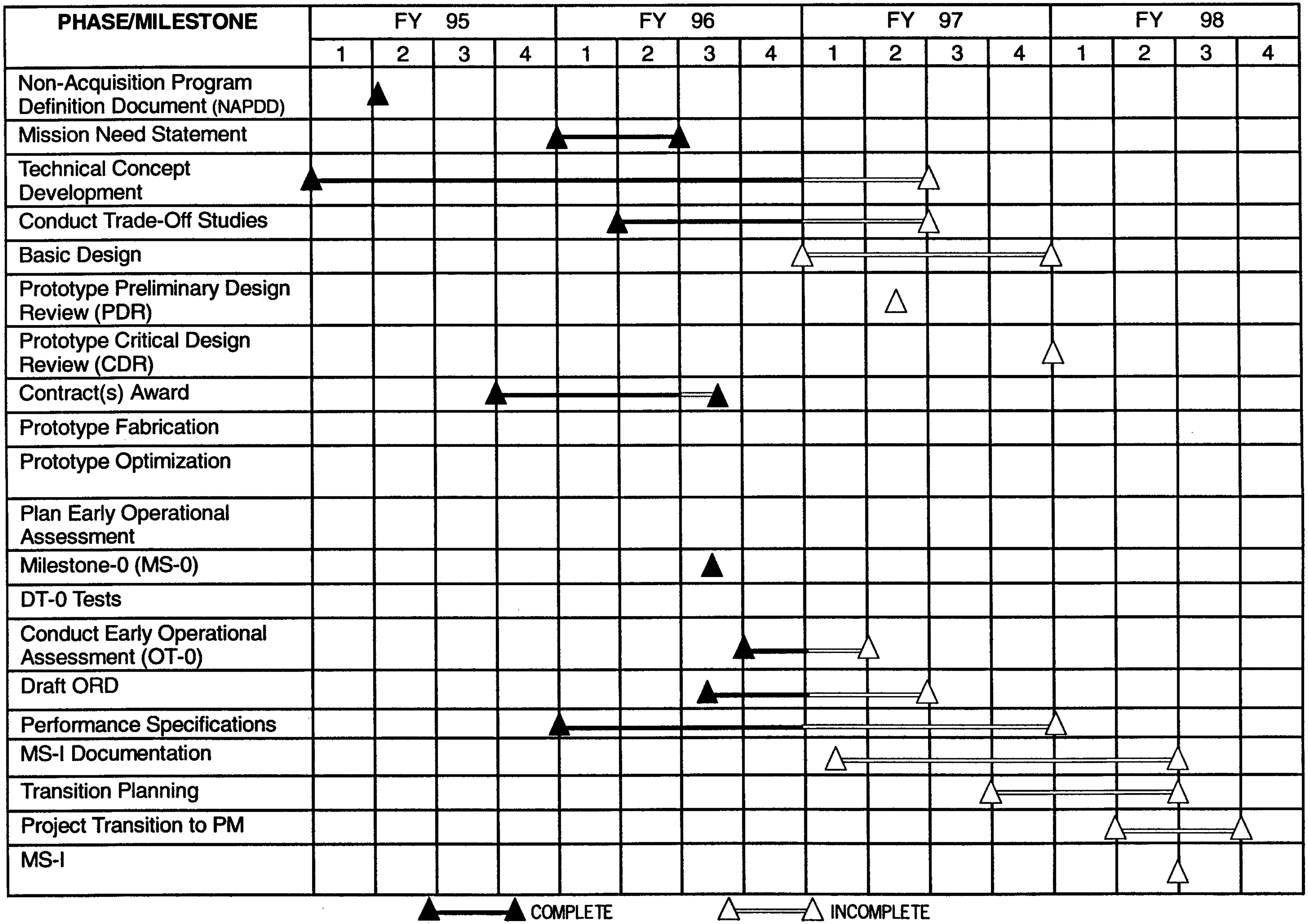
JOINT INTEGRATED ELECTRIC MOBILITY DEMONSTRATION (JIEMD) ATD MILESTONES



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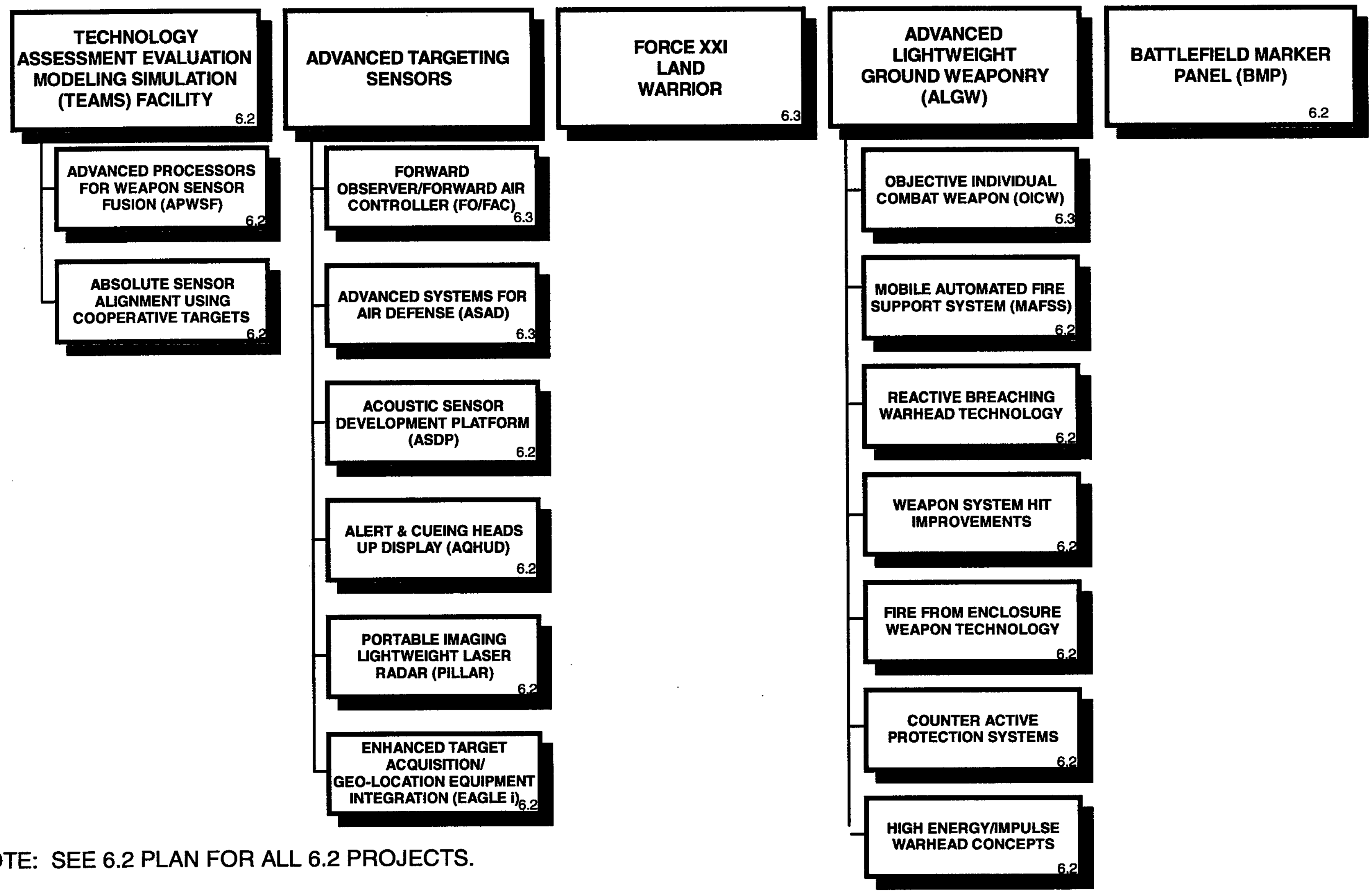
FIREPOWER IMPERATIVE



NOTE: SEE 6.2 PLAN FOR ALL 6.2 PROJECTS.

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Imperative Title: FIREPOWER

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ATD 1. ADVANCED SYSTEMS FOR AIR DEFENSE (ASAD)

Problem/Deficiency/Opportunity

A Marine Air-Ground Task Forces (MAGTF) can deploy anywhere in the world and must have the ability to maintain freedom of maneuver to position itself to defeat and / or control the threat. Ground based air defense (AD) fire units equipped with passive sensors can effectively detect, identify, and engage low to medium altitude air threats (at night/adverse weather) while reducing the probability of detection by enemy forces.

The Avenger and Man Portable Air Defense System (MANPADS) fire units currently rely on external radar cueing and visual air search, both having deficiencies, for target acquisition. Passive sensor technology being explored includes electronic support measures (ESM) and acoustic systems. ESM sensors exploit the radio frequency (RF) emissions of aircraft avionics equipment while acoustic sensors exploit the aircraft's acoustic signature. Both sensors have the ability to provide weapons system cueing as well as Non-Cooperative Target Recognition (NCTR). The multisensor integration of these two technologies is being pursued for Avenger and MANPADS applications. Sensors will be mounted on (i.e., organic to) the fire units to provide a stand alone target acquisition capability. The ability to sense while on-the-move (OTM) is also being addressed for Avenger.

Technical Objective/Expected Payoffs

The principle objective of the ASAD ATD is to demonstrate technologies to provide a passive target acquisition capability for Avenger (Pedestal Mounted Stinger (PMS)) and MANPADS (shoulder-launched Stinger) fire units. The ability to passively detect, acquire, and classify fixed wing (FW), rotary wing (RW), and UAV targets within the engagement envelope of Shore-based Air Defense (SHORAD) weapons systems will be demonstrated in an operational environment. This ATD will reduce technology risks and provide technology alternatives for the DEM/VAL phase of the acquisition cycle.

Avenger. The objective for Avenger is to develop vehicle mounted ESM and acoustic sensor capabilities that are fully integrated with Avenger and to demonstrate the ability to detect, classify, identify (ID), and track targets in a realistic battlefield environment. Performance goals must be met with Avenger stationary and operating as well as OTM.

MANPADS. The objective for the MANPADS is to develop a man-portable ESM and acoustic sensor capability to support target alert and cueing (A&Q). Growth potential to target classification and ID is desirable. Emphasis is placed on tradeoffs for maximizing performance while minimizing size, weight, power, and cost.

Modeling and Simulation (M&S). Another objective of the ASAD ATD effort is to develop M&S tools for atmospheric acoustics that will help facilitate the design and deployment of acoustic sensor technology on the Marine Corps battlefield.

Technical Background and Approach

Background. AD assets of the MAGTF must be able to deliver defensive fires under all conditions. This requires the ability of fire units to provide early warning and timely target acquisition. Avenger and MANPADS fire units currently rely on remote cueing (radar/voice) or visual air search to acquire and ID targets. Within the Marine Corps Expeditionary Air Defense System (EADS), HAWK radar data is broadcast over the Ground Based Data Link (GBDL) via the Single Channel Ground-Air Radio System (SINCGARS) radio to the Remote Terminal Unit (RTU) to provide gunners the tactical air picture relative to their own position. Existing radar systems used by the MAGTF can be easily located by the enemy, are susceptible to electronic countermeasures (ECM), and are limited in their ability to ID targets. Visual acquisition is minimally effective and rapidly diminishes with operator fatigue and in adverse weather and low light conditions.

The introduction of acoustic sensor technology will require a better understanding of ambient atmospheric acoustics as well as atmospheric sound propagation. Conditions that affect sound propagation can cause significant differences in sensor performance and will impact the way this technology is developed and utilized on the battlefield. M&S tools will be needed to relate target detectability to sensor detection performance in a particular acoustic environment. Fundamental research is still required to advance the most sophisticated M&S capabilities available today.

The need for an organic passive sensor is identified as one of the primary active AD surveillance and weapon deficiencies in Marine Corps Mission Area Analysis (MAA) 32 (Anti-Air Warfare (AAW)) deficiencies 5, 7, 8, 10, and 13. The requirement is also identified in the MAGTF AD Study of 26 July 1991 and validated by the MAGTF Ground Based AD Implementation Planning Group on 26 June 1992. The Marine MNS for a Ground Based AD Passive Sensor (dated 10 May 1993) defines the mission and threat that requires this technology and alternatives and constraints for its development.

Technical Approach. ESM and acoustic passive sensors will be developed and demonstrated for both fire units. Sensor priorities are for Avenger first followed by MANPADS. Maximum commonality between vehicle and man portable applications will be pursued. Avenger's passive sensors will also have application to Light Armored Vehicle (LAV)-AD fire units. Sensors will be integrated with the fire units and linked to the Marine Corps EADS via the SINCGARS RTU which will be used as the passive sensor display and fusion device. Data fusion (active and passive target tracks) will be demonstrated, where practical, within the scope of the effort. Sensor performance against FW, RW, and UAV targets will be measured. Benefits gained over the unaided gunner (e.g. detection range, reaction time) will be evaluated.

Army Forward Area AD (FAAD) NCTR sensor technology will be evaluated and modified, if necessary, to meet notional requirements for Avenger, where applicable. ESM and acoustic sensor prototypes developed at the NSWCDD, along with industry support, will be used to demonstrate the desired capability for the MANPADS. Algorithms from the underwater sonar community will be adapted for air acoustic solutions, wherever appropriate. Broad Agency Announcement (BAA) and Request For Proposal (RFP) processes will be used to solicit industry participation and establish sensor technology maturity.

Avenger. The Avenger ATD project will demonstrate a vehicle mounted ESM and acoustic dual NCTR sensor capability that is fully integrated with the fire unit and the EADS. Performance will be evaluated in the presence of vehicle and generator interference noise sources and typical RF environments.

The prime candidate for the ESM sensor of the Avenger system is the Marine Corps' enhanced AN/VSX-2 which transitioned from the Amphibious Warfare Technology (AWT) Directorate to the PM AD in 4Q94. The enhanced VSX-2 was fabricated by Magnavox in FY95. Changes to the baseline VSX-2 include a coarse Direction Finding (DF) capability (rear 270 degrees), ability to operate OTM, an improved processor, and other refinements to increase performance and reliability. DT will occur during 1Q96. Test results, along with affordability issues, will be used to support a Low Rate Initial Production (LRIP) decision in 2Q96. ESM sensors developed for the MANPADS will either complement the VSX-2 or will serve as back up candidates for the Avenger system should the VSX-2 be unsuccessful.

A competitive RFP for an Acoustic Target Acquisition System (ATAS) for the Avenger fire unit will be released to industry in 1Q95 with an anticipated award date by the end of 2Q95. ATAS will be required to detect and ID RW and UAV targets with the Avenger stationary and operating in the presence of vehicle and generator interference sources. The ability to adaptively cancel system noise from the Avenger engine and Environmental Control Unit (ECU)/Power Production Unit (PPU) simultaneously and still meet specification will be demonstrated. The detection performance requirement for the Avenger system operating OTM is somewhat degraded from the detection requirement for Avenger operating stationary. A DT resulting in a MS I decision is scheduled for 4Q96. The EMD phase for the ATAS will begin in 1Q97. A potential spin-off of a man portable configuration for MANPADS is anticipated.

A multiyear contract will be awarded to Raytheon to support PM AD efforts to integrate the VSX-2 and ATAS passive sensors on Avenger and within the EADS (tasking also applicable to MANPADS). An ATD of the Avenger "Dual Sensor" capability is scheduled for 3Q97.

MANPADS. For the Stinger MANPADS, this ATD project will demonstrate two independent, man portable, ESM and acoustic sensors that can provide the Stinger gunner a target A&Q capability. Algorithms that can classify and ID targets will be evaluated. BAA contracts with AEL and Sanders and in-house research and development (R&D) efforts will continue to advance passive sensors for the MANPADS.

Results of a Government/Industry "Sense-Off" (1Q94) and encouraging progress made on man portable ESM sensors developed by AEL (MANPADS-Q) and NSWCDD Passive Sensor for AD (PSAD) during FY94 led to a decision to continue the investment in both these prototypes for FY95. MANPADS-Q is a low to moderate cost receiver that detects emitters in the radar and Identification Friend or Foe (IFF)/Tactical Air Control And Navigation (TACAN) bands and incorporates high sensitivity Continuous Wave (CW) bands for detecting altimeter and Doppler navigation systems. PSAD is a low cost radar band receiver that incorporates sophisticated classification and ID algorithms. MANPADS-Q and PSAD will be candidates for the Avenger ESM sensor should the VSX-2 fail or become an affordability issue. A competitive RFP will pursue development of a low to moderate cost ESM sensor for MANPADS based on the results of the DT and VSX-2 LRIP decision. If the VSX-2 is successful, the RFP will address ESM sensor performance that meets MANPADS requirements and compliments the VSX-2 ESM coverage. If the VSX-2 is unsuccessful, the ESM sensor developed will address the requirements for both Avenger and MANPADS.

A BAA contract award (FY94) with Sanders will be used to investigate, design, fabricate and test a man portable acoustic sensor to support MANPADS. In FY95/96, the prototype will continue to be evaluated to assess performance and solicit user inputs for future enhancements. Lessons learned will be incorporated during the ATAS EMD (FY97) which will hopefully develop both a vehicle and man portable acoustic sensor with maximum commonality.

ESM and acoustic passive sensors for MANPADS will be integrated into a multisensor suite beginning in FY98, should the user opt for a MANPADS "Dual Sensor" configuration.

M&S. A user/developer consortium will be assembled to begin development of an authoritative atmospheric acoustic M&S capability. Efforts will concentrate on evaluation of the existing M&S capability, identification of viable options to provide a near term capability to support ASAD efforts, and long range planning to support Marine Corps unique requirements and a DIS implementation for atmospheric acoustics.

Summary of Prior and Current Year's Work

This ATD transitioned technology from an Applied Research (6.2) effort that demonstrated the potential of on board NCTR and A&Q sensors for Avenger, LAV-AD, and MANPADS fire units. Work on the vehicle based sensor was in cooperation with the Army. The MANPADS work was conducted in-house at NSWCDD with industry support. The ASAD ATD was a new start in FY93 and is managed by NSWCDD.

Avenger. During FY94, NSWCDD continued to participate in the Army's ESM NCTR (VSX-2) integration and demonstration on the Avenger. (Note: The VSX-2 achieved Milestone (MS) II in March 91. Ten EMD units were completed to begin pre-production qualification testing (PPQT). An operational demonstration on Avenger was conducted at Redstone Arsenal in November 93. Limited User Testing (LUT) was conducted February - April 94 at White

Sands Missile Range (WSMR). To satisfy United States Marine Corps. (USMC) sensor requirements, Magnavox was tasked to study and recommend an enhancement program to develop a modification kit for the baseline VSX-2 that would provide the additional capability of: (1) 360 degrees coarse DF; (2) an improved processor; and, (3) OTM operation. The enhanced capability provided by the modification kit formed the basis for the ATD in the ESM sensor area. Based on results of the VSX-2 PPQT and LUT and the Magnavox enhancement study, Magnavox was tasked to begin work on the VSX-2 modification kit. A Marine Corps/Army Memorandum Of Understanding (MOU) was established to allow the Marines to use the Army LRIP contract to procure VSX-2 baseline units in FY95. The Army subsequently lost its procurement money for the VSX-2 and the PM AD continued work on the enhanced VSX-2 with Army contractual support. During FY95, Magnavox completed fabrication of two (2) VSX-2 modification kits and integrated them with the Avenger and RTU. A Test and Evaluation Master Plan (TEMP) and Developmental Test Plan (DTP) were prepared for Avenger NCTR. Preparation and coordination was made for the DT, which was to be conducted in conjunction with Marine Corps Weapons and Tactics Instruction (WTI) in Yuma, AZ from 25 September - 14 October 1995. ASAD man portable ESM and acoustic prototypes were to have been tested along side the VSX-2 to provide the PM AD with performance versus cost tradeoffs for candidate passive sensors. However, test readiness issues with the VSX-2 and ongoing realignment of priorities and budget resulted in the PM AD postponing the DT pending a Marine Corps internal review of the VSX-2. The PM AD subsequently terminated the VSX-2 effort in Oct 95 based on Avenger's priorities (passive sensor low priority) and limited budget (VSX-2 had experienced huge cost growth).

An acoustic sensor prototype developed by Sanders for the Army's NCTR program was mounted on Avenger for real time system evaluation to identify technology enhancements and conduct risk assessment. A stationary test was performed at Marine Corps Air Station (MCAS), New River, NC in June 93. Results of the stationary test clearly indicated the potential to meet host vehicle requirements. (Note: The Army's acoustic NCTR program completed Phase I testing of prototypes from Sanders, Hazeltine, and General Dynamics at Fort Bliss (4Q91). Phase II EMD was terminated because of the loss of Fiber Optic Guided Missile (FOG-M) and Air Defense Anti-Tank System (ADATS) platforms, low prioritization, and lack of a fully specification compliant system.) Alliant Techsystems was funded to modify their acoustic hardware (MCM - BRDEC) for similar testing on Avenger (1Q94). Sanders also demonstrated one of its Army developed prototypes on an LAV platform at Camp Upshur (2Q95). Based on results of these tests, a specification and Statement Of Work (SOW) for ATAS were completed and an RFP released to industry (January 95). Three offerors responded: Sanders; Alliant Techsystems; and, Rafael/DRS. The ATAS evaluation committee selected the Sanders proposal as the best value and awarded an initial offer (July 95). The award was made on the basic contract only - to design, fabricate, integrate, test and deliver one (1) ATAS with a period of performance of one year. An option to procure a second ATAS may be executed in FY96 to ensure that sufficient hardware is available for an ATD. If ATAS is successful, the contract provides for another option to develop the specification and plan for a follow on EMD effort.

In support of this effort, and at the direction of the PM AD, NSWCDD awarded an engineering support contract to Raytheon. Raytheon completed integration of the VSX-2 with

Avenger. Raytheon is currently integrating a Land Navigation System (LNS) with Avenger to provide the passive sensor and weapon system with input to support target acquisition and shooting OTM.

MANPADS. AEL (MANPADS-Q) completed a redesign of their high sensitivity CW receiver channel to provide a substantial improvement in performance. A successful demonstration of the CW receiver (January 95) at their facility completed Phase I of their contract effort. Phase II of the contract was awarded which involved integrating the high sensitivity CW receiver (3 bands) and an IFF/TACAN band with their already existing 2-18 Gigahertz (GHz) pulse radar band receiver. This would provide a low to moderate cost receiver that would duplicate the ESM coverage of the VSX-2 as well as the coverage of the PSAD. AEL also made improvements to the MANPADS-Q side lobe blanking, false alarm rate, probability of detection, and data throughput and display. After final integration of MANPADS-Q, AEL reported that the sensitivity of the CW receivers (demonstrated in Phase I) had fallen short of its performance goal because of cross channel interference due to lack of isolation in the board layout. This is not a problem with the receiver design and could be corrected by a new board layout. MANPADS-Q can still be tested and performance extrapolated to account for the decrease in sensitivity in the CW band. AEL completed all Phase II tasking with the exception of participating in the DT. However, they have notified the government that all funding under the Cost Plus Fixed Fee (CPFF) contract has been expended and additional funding is required to support the DT, reduce data, and provide a final report. A decision to proceed will be based on a MANPADS-Q system demonstration at the vendors facility (1Q96) and available funding.

NSWCDD made enhancements to the PSAD hardware and software during FY95 to reduce size/weight/power, increase performance and reliability, and incorporate algorithms to provide a target classification and ID capability. A few highlights include a new high speed counter for improved measurement accuracy, a lower profile antenna, an embedded processor to eliminate operation with a Personal Computer (PC) and allow only an umbilical cord to interface directly to the RTU, an improved operator display, and a totally integrated RF front end that will substantially reduce size, weight, and cost for the PSAD. The embedded processor is being upgraded to a Pentium in order to handle the sophisticated ID algorithms in real time. The PSAD has been interfaced with the RTU but not fully integrated into the EADS. American Microwave has experienced a delay in delivering the integrated RF front end. This is holding up the final repackaging and integration of the new and improved PSAD. However, NSWCDD is maintaining a test bed version of the PSAD so that all other major improvements can be validated during field testing.

Successful testing of a prototype, man portable, acoustic sensor developed by Sanders was completed 4Q94 at Fort A.P. Hill. Results clearly indicated the potential to meet MANPADS A&Q requirements. Under a contract option, NSWCDD procured one of these prototypes for additional T&E. Sanders made substantial improvements to the NSWCDD unit based on field testing and user comments. The unit was delivered in June 95 but has experienced numerous problems which were not characteristics of the original prototype. The unit was returned to Sanders for repair 4Q95.

M&S. Several meetings were held with representatives from NSWCDD, Army Research, Development, and Engineering Center (ARDEC), Army Research Laboratory (ARL)/Penn State, Sanders, and Massachusetts Institute of Technology, Research and Development (MITRE) to lay the ground work for establishing a M&S capability for atmospheric acoustics. Potential user/developer interested parties were identified and existing M&S capabilities discussed. NSWCDD drafted a long range plan for developing the desired M&S capability titled "Modeling and Simulation for Targeting Sensors" (MASTS). The MASTS plan is oriented toward a Marine Corps perspective but is flexible enough to accommodate other users. Several of the MASTS near term goals were also funded (see below). NSWCDD will monitor all efforts to provide maximum synergism and avoid duplication.

MITRE provided support to the ATAS RFP by acting as technical advisor to the ATAS evaluation committee. Pursuant to that same effort, they began work on a Spatial Processing Evaluation Tool for air Acoustics (SPET-A) that can be used to determine Beam Forming (BF) algorithm performance from an acoustic sensor's physical attributes and signal processing capability and compare different sensor BF performance. MITRE delivered a multipath propagation loss model implemented in Matlab to provide NSWCDD with an initial evaluation tool to assist in the ATAS development. This model describes the propagation of sound from a point source above an impedance plane and includes a four parameter ground impedance model.

ARL/Penn State was funded to begin work on their Battlefield Acoustic Sensor Integration System (BASIS) program. The BASIS program will leverage previous M&S efforts developed for ARDEC (Battlefield Acoustic Sensor System (BASS) - Requirements Translation Model (RTM)) to provide the Marine Corps an improved acoustic performance model tailored to a littoral environment to support ASAD and targeting sensor efforts. The main difference between the BASIS and the BASS-RTM will be the ability to model multiple target signatures for arrays of microphones. This will allow comparison of BF algorithms and array processing techniques. ARL's initial BASIS program will be delivered in Dec 95. Fully documented executable software will be capable of running on a standard PC under MicroSoft (MS) Windows. A Matlab tool set will also be provided.

As part of the BASIS effort, Sanders was funded to work with ARL to provide an adaptive Minimum Variance Distortionless Response (MVDR) optimal BF as a software module within the BASIS. The ARDEC will contribute (Army funding) a simple Bartlett-type delay-sum BF algorithm for the BASIS.

Planned Work

Avenger. The ESM passive sensor for Avenger will be deferred until T&E is complete on MANPADS-Q and PSAD. One of these sensors may replace the VSX-2 so that Avenger can proceed with a dual sensor capability. Otherwise, the requirements for the Avenger ESM sensor will be addressed in the ESM RFP (see MANPADS below). The ATAS development will continue throughout FY96. An option to procure a second ATAS may be executed 2Q96 based on contractor's performance and funding availability. Integration with Avenger is scheduled for

3Q96. Government acceptance testing and ATAS DT are scheduled for 4Q96. OT-0 will be conducted at Marine Corps WTI-1/2 exercises 1Q97/3Q97 in Yuma, AZ.

Raytheon continues to add the required Input/Output (I/O) cables, connectors, and software to support the integration of passive sensors with Avenger and MANPADS and passive sensor data correlation and fusion within EADS. In FY96, Raytheon will work with Sanders to define the ATAS interface and integrate ATAS with Avenger. The Avenger LNS will also be tested.

MANPADS. Since the VSX-2 DT and program have been terminated, NSWCDD is currently planning another test to demonstrate the capabilities of MANPADS-Q and PSAD ESM passive sensors. Test results should demonstrate the potential to satisfy MANPADS requirements and provide an indication of MANPADS-Q and PSAD suitability as a candidate ESM sensor for Avenger. Performance versus cost tradeoffs will be made to reduce technology risks and provide EMD sensor development options. DT is scheduled for 2Q96 followed by OT-0 in 3Q96.

A competitive RFP will pursue development of a low to moderate cost ESM sensor for Avenger and MANPADS. This RFP will be an outgrowth of demonstrated ESM performance of ASAD 6.2/6.3 efforts (VSX-2, MANPADS-Q, PSAD, and others) to date. A performance specification and SOW will be generated 2Q96 and an RFP will be released to industry 3Q96 with an anticipated award during 4Q96. Potential sensor performance/configuration options that the RFP may address include: 1) a man portable ESM sensor that meets both Avenger and MANPADS requirements and is suitable for both configurations; 2) two separate ESM sensors for Avenger and MANPADS applications that meet their respective requirements and maximizes commonality between the systems; and, 3) other options resulting from the tradeoff study in paragraph above.

OT-0 of the Sanders man portable acoustic sensor prototype will be conducted at WTI-2 (3Q96) and during other exercise opportunities. The sensor will be tested during the ATAS DT. This will provide cost versus performance tradeoffs for vehicle and man portable configurations and options for the EMD development cycle.

M&S. Tasking in FY96 will be executed per the MASTS plan. In-house efforts will concentrate on algorithm development for improved target detection and ID. Acoustic signature measurements of high value targets will continue. A study will be initiated for assessment of an appropriate host computer platform and peripherals needed for efficient M&S development and DIS implementation.

MITRE will provide scientific and engineering support to the ATAS development. SPET-A will continue to be enhanced and utilized along with other M&S tools to support ATAS. SPET-A capability improvements will focus on the effects of: background noises; sound generation directionality factors; sensor reception directional response dependencies; and, propagation loss modeling with effects for environment objects, features, and attributes.

Further development of the BASIS program is also planned in FY96. ARL will focus on model validation, utility of the program for near real time performance evaluation of sensor arrays, and incorporation of adaptive noise cancellation concepts into the sensor array performance. Credible sound propagation tables for littoral areas including models for surf noise will be developed. Models will be validated experimentally with actual recorded data from field tests. The BASIS will be used to help evaluate ATAS design strengths and weakness'.

Transition Plan

The ASAD effort is fully coordinated with, and will transition to, the PM AD. Coordination and funding for the integration of passive sensors with the fire units and within EADS is provided by the PM AD. The integration effort is ongoing, and will permit DT/OT to be conducted in a real operational environment. Elements of ASAD have already transitioned. The VSX-2 transitioned during 4Q94 following an evaluation of the baseline VSX-2 and the definition, specification, and design of a modification kit for the enhanced VSX-2. Other elements, including ATAS and man portable ESM (MANPADS-Q and PSAD), are already under PM AD management of AWT provided funding. The PM AD Program Objective Manager (POM) submission includes passive sensors for Avenger and MANPADS fire units and was recently updated for FY98.

Although the PM AD has terminated the VSX-2 effort, the requirement remains for passive sensors. The Required Operational Capability (ROC) for Avenger cites the need for a passive sensor although it is a low priority based upon Avenger's budgetary constraints. The approved MNS/draft Operational Requirements Document (ORD) for Ground Based Air Defense Passive Sensors addresses requirements for all air defense fire units. An approved MNS/ORD exists for a passive sensor for the Tactical Air Operations Center (TAOC). Combat ID initiatives provide another avenue of opportunity for the role of passive sensors.

NSWCDD is planning another DT to demonstrate performance capabilities of man portable ESM sensors (MANPADS-Q and PSAD) which may also provide a low cost alternative for Avenger. Results of the DT, along with previous test results of vehicle and man portable acoustic sensors, will be used to document ASAD passive sensor capabilities to date (March 96). Transition of the ASAD program to the PM AD is anticipated in FY99.

Relationship to Other Programs

Avenger. Both the VSX-2 and ATAS efforts have their origins from Army FAAD NCTR programs. A Memorandum of Agreement (MOA) between the Army Program Executive Office (PEO) for Intelligence and Electronic Warfare (IEW) (PM Combat ID) and MARCORSYSCOM (PM AD) is in place for the VSX-2 and is being expanded to include all NCTR technology, Cooperative ID, and Combat ID initiatives. The Army Communication - Electronics Command (CECOM) managed Hunter Sensor utilizes a vehicle mounted acoustic sensor that is also developed by Sanders under subcontract to Texas Instruments. An arrangement with

NSWCDD's Electronic Warfare Support Branch, which provides the threat emitter signature library for the Navy's SLQ-32 shipboard ESM system, is in place to provide similar data for PM AD's passive sensor requirements.

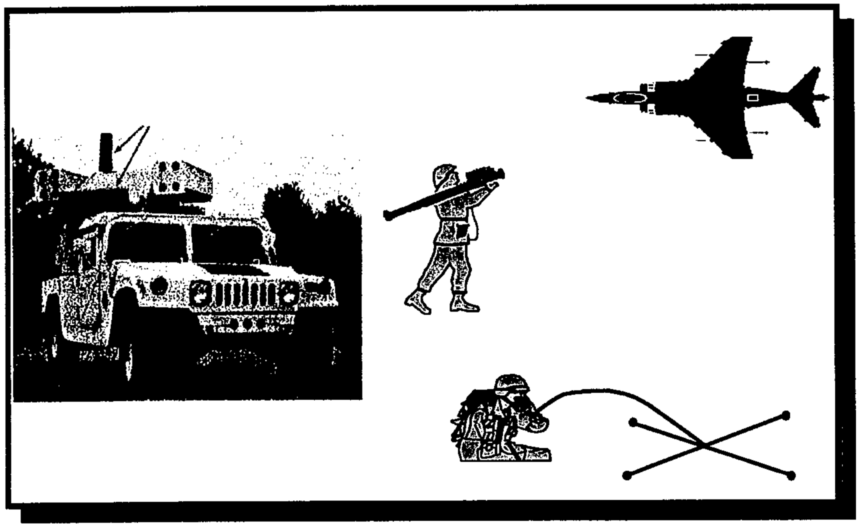
The VSX-2 incorporates technology applicable to the Navy's Advanced Integrated Electronic Warfare System (AIEWS) Phase II objectives.

MANPADS

Air acoustic sensor programs which are monitored for applicable technology include Remote Sentry, Smart Standoff Mine Active Countermeasures (SSMAC)/Surrogate Ground Sensor System (SGSS), Intelligent Mine Field (IMF), Wide Area Mine (WAM), Anti-Helicopter Mine (AHM), Unattended Ground Sensors (UGS) (Teson 1), Improved UGS (IUGS), and Expendable Acoustic Remote Sensors (EARS). The Army Missile Command (MICOM) has expressed interest in MANPADS-Q and PSAD for Stinger A&Q. The Navy has expressed an interest in ASAD man portable ESM and acoustic passive sensors for their Patrol Craft (PC) platform. The EOD Technology Center has developed a hand held variant of an earlier MANPADS-Q prototype for the U.S. SOCOM. The Norwegian and Swiss militaries have asked AEL to demonstrate the MANPADS-Q. AEL has applied for appropriate export licenses.

M&S. The SPET-A model for air acoustics is an outgrowth of the SPET model developed by MITRE for Space and Naval Warfare Systems Command (SPAWAR) to evaluate Shallow Water Adaptive Spatial Processing for underwater acoustic environments. ARL's BASIS model is an upgrade of ARDEC's BASS-RTM model. Additional users of air acoustic M&S programs that will benefit from this effort include; ARDEC (IMF), BRDEC Off-route Smart Mine Clearance (ORSMC), DARPA (IUGS), CECOM (Remote Sentry and Hunter Sensor), Tank-automotive Command (TACOM) (Vehicle Survivability), NSWCDD (Targeting Sensors - EARS), WAM, AHM, and Tactical Remote Sensor System (TRSS) programs. Numerous models exist which provide part of the required solution. One of the goals of this program is to identify all user/developers to reinforce and enhance the state-of-the-art and eliminate duplication of effort. This capability will eventually function as a defined node operating in a DIS network M&S environment.

ADVANCED SYSTEMS FOR AIR DEFENSE (ASAD)



OBJECTIVE:
- DEVELOP PASSIVE TARGET ACQUISITION, CLASSIFICATION, IDENTIFICATION, AND RANGING AND TARGET SIGNATURE FINGERPRINTING

CAPABILITIES:
- VLO AIR TARGET DETECTION/TRACKING (Y-Q2)
- IMPROVED QUEUING OF MANPORTABLE AAW WEAPONS SYSTEM (SENSORS ONLY) (Y-Q2)
- STAND-ALONE ONBOARD ALERT & CUE SENSORS FOR STINGER TEAMS (NAPDD)
- IMPROVED ENGAGEMENT CAPABILITY AGAINST LOW ALTITUDE THREATS (NAPDD)
- VEHICLE AND MANPORTABLE A&Q (NAPDD)

APPROACH:
- PASSIVE ACOUSTIC SENSOR DEVELOPMENT/INTEGRATION
- PASSIVE ESM SENSOR DEVELOPMENT/INTEGRATION
- INTEGRATE ACOUSTIC/ESM SYSTEM INTO AVENGER
- ELECTRONICS SUPPORT MEASURES SENSOR
- INTEGRATE WITH GROUND STINGER TEAMS
- LINK TO EMERGING GROUND BASED DATA LINK FOR AIR DEFENSE
- JOINT INTEREST WITH ARMY

PERFORMERS:
- NSWCDD, CECOM
- AEL, LOCKHEED SANDERS, MAGNAVOX, RAYTHEON

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
DT/OT	▲			
LAND-NAV DEMO	▲			
ASCIET 96	▲			
UAV DETECTION/ID DEMO	▲			
ADVANCED HUD	▲			△

TRANSITION:
- PM - C4I/AD

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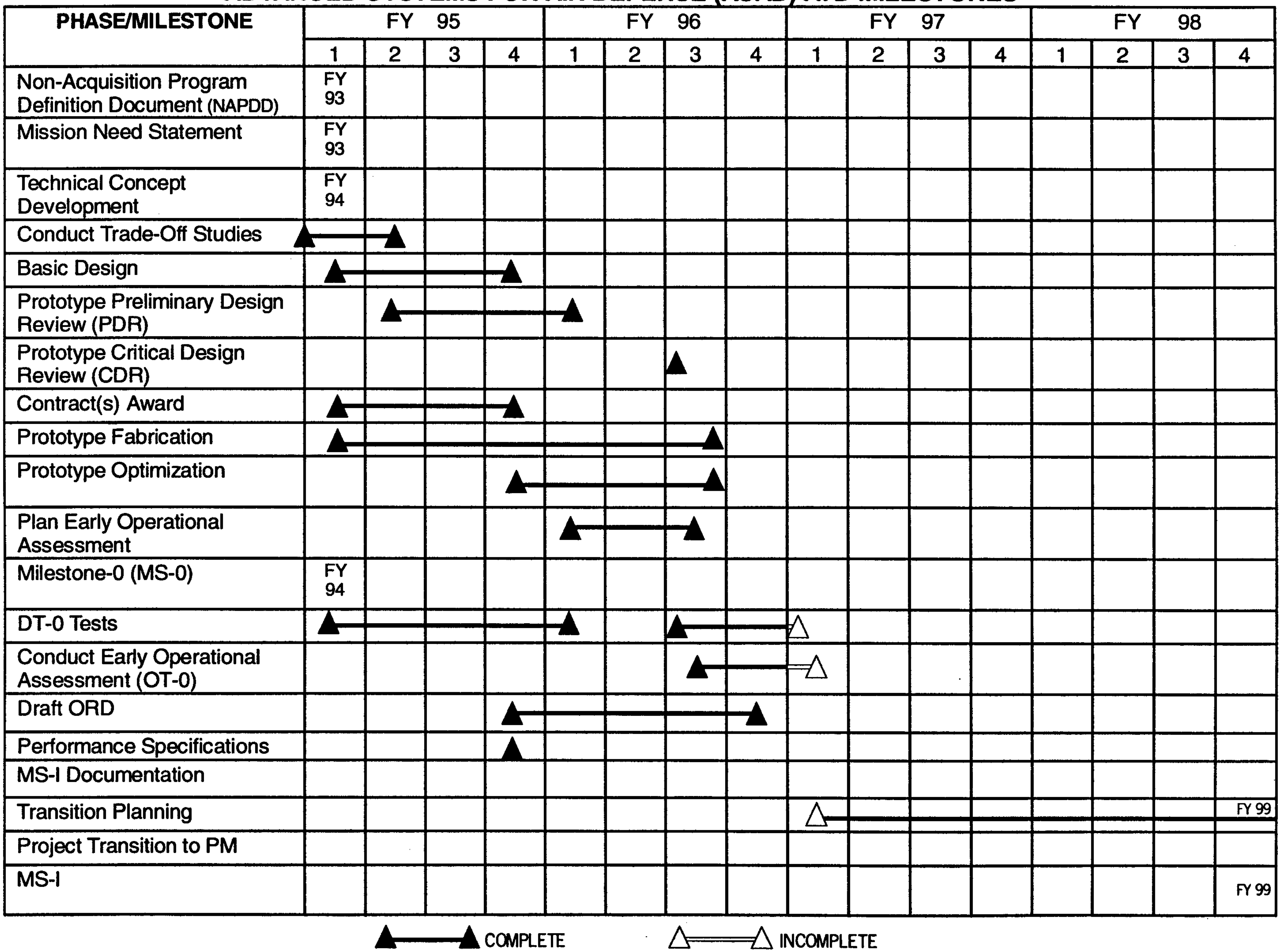
ADVANCED SYSTEMS FOR AIR DEFENSE (ASAD) ATD MILESTONES



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ATD 2. FORWARD OBSERVER/FORWARD AIR CONTROLLER (FO/FAC)

Problem/Deficiency/Opportunity

The current mix of support equipment presently being used by Marine FOs and FACs to perform their missions has significant deficiencies in several areas including: speed and accuracy in locating targets and adjusting fire; providing timely and accurate targeting data in digital format; size and weight of equipment; and/or, ease of operation. These deficiencies: reduce the effectiveness and survivability of supporting arms; diminish situation awareness; raise the risk of fratricide; and/or, increase the combat load of FOs and FACs.

The goal of the FO/FAC ATD project is to develop and demonstrate a system concept for alleviating these deficiencies by providing an integrated target location and handoff system which is easily man portable, user friendly, and capable of rapidly and accurately locating targets and digitally transmitting targeting data over tactical communications links to the appropriate fire support elements.

Technical Objective/Expected Payoffs

Specific technical objectives of the FO/FAC ATD project are to: address critical technical and system tradeoff issues including those related to technical performance, operational effectiveness and suitability, and life cycle cost; design, develop, and fabricate FO/FAC concept demonstration systems which will fulfill FO/FAC mission requirements and are also easy to use and carry; design/implement a system architecture based on modular, open, and structured design approaches; perform developmental testing (i.e., DT-0) to characterize and evaluate the performance of the FO/FAC ATD systems from a technical and engineering perspective (e.g., quantify system and subsystem performance parameters, etc.); and, perform early user assessments (i.e., OT-0) to demonstrate and evaluate the operational utility and effectiveness of the FO/FAC system concept under representative operational and field conditions.

The enhanced capabilities provided by the FO/FAC system are expected to result in the following payoffs: substantially increased effectiveness and survivability of supporting arms; enhanced interoperability with fire support elements; enhanced capabilities to adjust fire and engage moving targets; improved situation awareness and reduced fratricide; and, reduced observer combat load.

Technical Background and Approach

To fulfill their missions, FOs, FACs, and other battlefield observers and fire support personnel must have the capability to quickly and accurately detect and locate targets for attack by supporting arms Fixed Artillery (FA), Close Air Support (CAS), Naval Surface Fire Support (NSFS), etc.) and to hand off the required targeting data (in digital format) over tactical radios.

The technical approach developed for the FO/FAC ATD follows a systems engineering approach to ensure that the design and development process is driven by, and responsive to, clearly identified system requirements.

Critical FO/FAC system issues addressed during the ATD include those related to: development of the system specification, architecture, and design; assessing the overall system target location error and its relationship to the associated system error "budget"; selection of enabling technologies and system components (options, performance, tradeoffs); accuracy and responsiveness of communications; compatibility supporting arms systems, procedures, and equipment; user interface design and implementation and human factors issues; and, providing more effective means for engaging moving targets and adjusting fire.

Summary of Prior and Current Year's Work

Prior to the initiation of the FO/FAC ATD project, an Applied Research (6.2) program entitled FO/FAC Support Technology was conducted by the NSWCDD to address the mission equipment needs of Marine FOs and FACs. FO/FAC system concepts were conceived and developed. Breadboard systems were designed, fabricated, tested, and successfully demonstrated. The 6.2 effort established the technical feasibility of implementing the FO/FAC system concept and identified the critical technical issues to be addressed in the ATD.

The ATD execution strategy included the use of a BAA to solicit industry participation and support. To that end a BAA was issued and an industry briefing presented to interested parties. Two contractor proposals for FO/FAC ATD system design and fabrication were funded for a preliminary design phase. Both contractors' preliminary designs were completed by the first quarter of FY94 and one contractor was funded to continue on through detailed design, fabrication, testing, and evaluation. The selected FO/FAC ATD system design integrated a Global Positioning System (GPS) p-code receiver, an eye-safe laser rangefinder with a compass and vertical angle measuring unit, a small tactical computer, an embedded digital communications processor, and a hand held user input/output device with a graphical user interface.

During FY95 fabrication and hardware/software acceptance testing of three FO/FAC ATD systems was completed and then DT-0 testing was conducted at Yuma, AZ; China Lake, CA; Twentynine Palms, CA; and, Dahlgren, VA. The objectives identified for and successfully achieved during these tests were as follows: to characterize and evaluate the performance of the FO/FAC systems from a technical and engineering perspective (e.g., to quantify system and

subsystem performance parameters, etc.); to gain experience with the operation and performance of the systems under field conditions to identify and validate FO/FAC operational and interface requirements as input to the system specification development process and to identify required and desirable revisions to the systems prior to operational testing; and, to prepare for OT-0 by validating and fine tuning the test scenarios and procedures planned for the early user assessments.

Also during FY95, preparations were begun for OT-0 which is scheduled for FY96. OT-0 preparations included development of CAS and FA scenarios and execution of some of these scenarios in the field. The FO/FAC ATD systems were also used to support warfighting concept demonstration exercises (Operation Killer Angel) performed at Quantico, VA in April 1995 and to participate in the All Service Combat Identification Evaluation Team (ASCIET 95) exercises at Camp Shelby, MS in September 1995.

Planned Work

During FY96 early user assessments will be conducted. The primary goals of OT-0 are to demonstrate and evaluate the utility and effectiveness of the FO/FAC system concept from an operational perspective, to obtain user feedback, and to obtain input for the development of the FO/FAC system performance specification and associated requirements documentation. Current plans are to conduct the OT-0 in three phases: a FA phase in Fort Bragg, NC and Camp Lejeune, NC; a CAS phase in China Lake, CA and/or Twentynine Palms, CA; and, a NSFS phase in Puerto Rico. Results from all ATD tests and demonstrations will be documented in DT-0 and OT-0 reports and all documentation required to support a MS I decision will be prepared.

Transition Plan

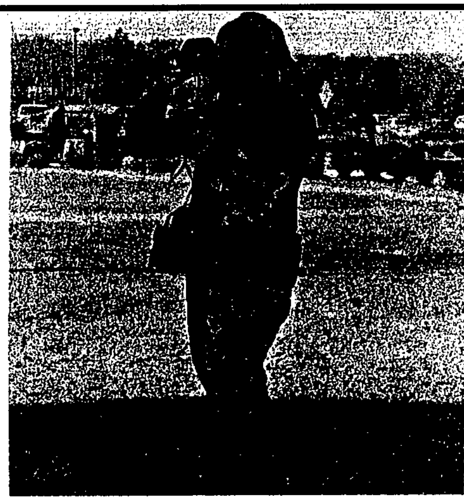
The exit criteria identified for transition of the FO/FAC ATD program to 6.4 will be the demonstrated ability of the FO/FAC system to provide the following: an automated capability for accurately determining observer location; an automated capability for accurately determining target location; an integrated, computer-aided communications capability to transmit, receive and edit Marine Tactical System (MTS) and Tactical Fire (TACFIRE) messages; the ability to operate with Automatic Target Handoff System (ATHS) equipped aircraft and the Initial Fire Support Automation System (IFSAS); an enhanced capability to adjust fire; an enhanced capability to engage moving targets; the ability to interface and interoperate with a laser target designator; and, a functionally integrated day/night capability

At a point in the program mutually agreed to by the Director, AWT Directorate and the PM for Ground Weapons (the receiving PM), the overall FO/FAC program management function was transitioned from AWT to the PM Ground Weapons. This transition occurred 6 Feb 96. The MS I decision is planned to take place during the fourth quarter of FY 96.

Relationship to Other Programs

The FO/FAC ATD project is providing support, technology, and/or FO/FAC systems to a NSFS Digitization Demonstration, the Rapid Force Projection Initiative (RFPI), Force XXI Land Warrior (FXXI LW), and the Battlefield Combat Identification (BCID) System Enhanced FAC demonstration programs; and is also collaborating with related Marine Corps, Army, and DARPA programs.

FORWARD OBSERVER/FORWARD AIR CONTROLLER (FO/FAC)



OBJECTIVE:
- PROVIDE ENHANCED CAPABILITIES TO:
  - QUICKLY AND ACCURATELY LOCATE AND IDENTIFY GROUND TARGETS FOR ATTACK BY INDIRECT FIRE WEAPONS AND CLOSE-AIR SUPPORT (CAS)
  - RAPIDLY TRANSMIT TARGETING DATA TO FIRE SUPPORT ELEMENTS
  - QUICKLY AND ACCURATELY ADJUST FIRE

CAPABILITIES:
- PRECISION LOCATION OF TARGETS AT SUBSTANTIAL RANGES (NAPDD)
- AUTOMATIC CALL FOR FIRE (NAPDD)
- RAPID CALL FOR FIRE/ADJUSTMENT (NAPDD)
- AUTOMATED TARGET HANDOFF (NAPDD)

APPROACH:
- DEVELOP STRUCTURED/FLEXIBLE SYSTEM ARCHITECTURE
- DEVELOP LIGHTWEIGHT, EASILY MANPORTABLE, INTEGRATED/COMPATIBLE SYSTEM
- TEST/DEMONSTRATE/EVALUATE CONCEPT DEMONSTRATION FO/FAC SYSTEMS UNDER REPRESENTATIVE OPERATIONAL CONDITIONS (DT/OT-0)
- CWL AWEs/LOEs
- DESIGNATION, STABILIZATION, NIGHT ALL-WEATHER, AZIMUTH, HUMAN FACTORS TECHNOLOGY INSERTIONS

PERFORMERS:
- NSWCDD
- ROCKWELL

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
DT/OT	▲—▲			
NGF DEMO	▲			
ASCIET 96	▲			
FABRICATE 10 UNITS FOR AWE	▲	—△		
SYSTEM IMPROVEMENTS (6.2)	▲	—	—	—△

TRANSITION: PM GROUND WEAPONS

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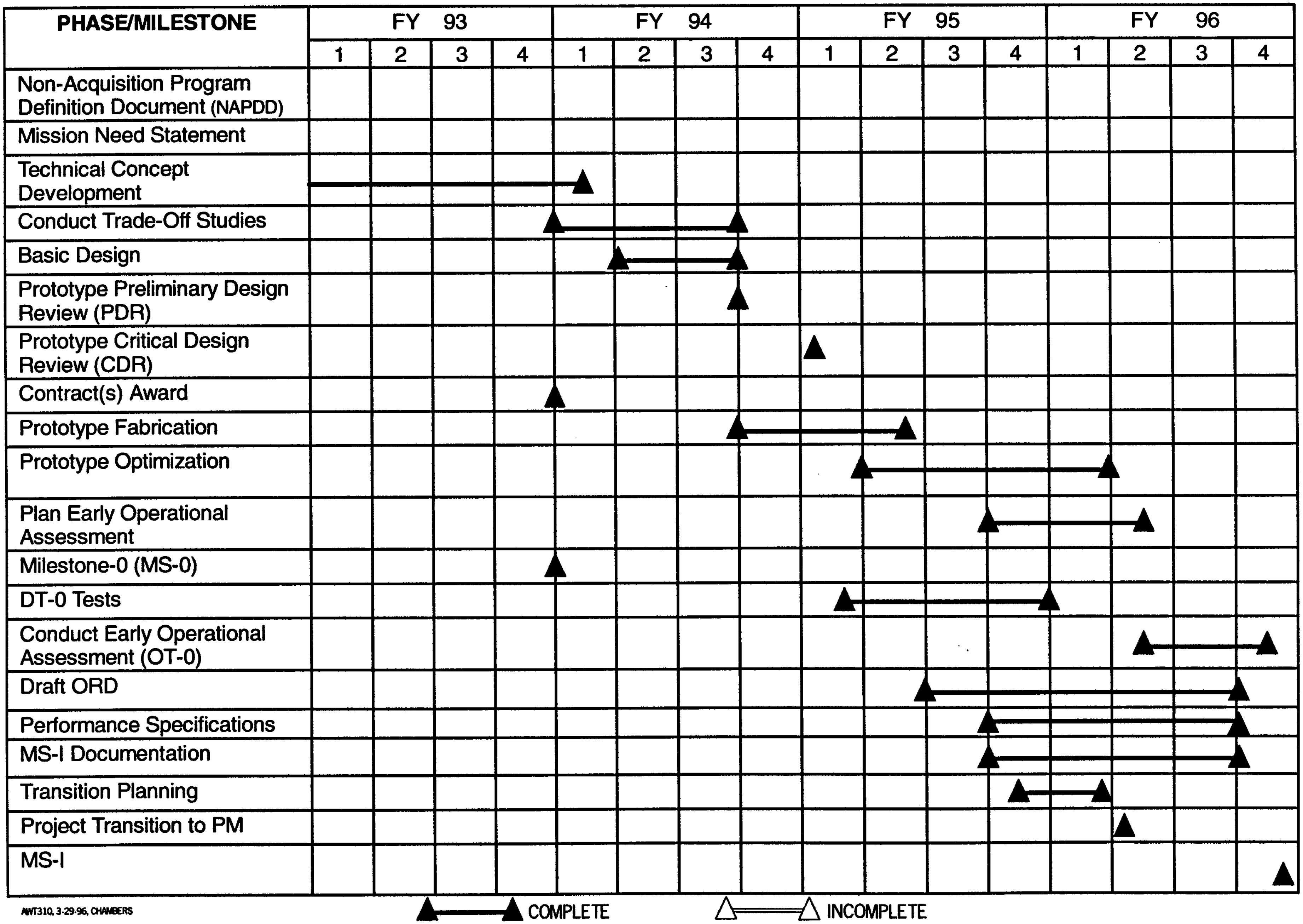
FORWARD OBSERVER/FORWARD AIR CONTROLLER (FO/FAC) ATD MILESTONES



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ATD 3. FORCE XXI LAND WARRIOR (FXXI LW)

Problem/Deficiency/Opportunity

In the rapidly evolving and increasingly complex world of infantry operations, the individual warfighter is being provided with a wide variety of systems, each designed to provide or enhance various capabilities deemed necessary to dominate the battlefield. As each improvement is developed, little thought is given to the integration of the system into a whole. It is presumed that the system will be carried as a separate item, to be used only when called for. While there is a need for modularity within the evolving designs, the integration of a number of systems into a single ensemble provides advantages that will simplify the tasks of the infantryman while providing him complete situation awareness and enhanced performance on the battlefield.

Technical Objective/Expected Payoffs

The revised acquisition strategy meets Army Training and Doctrine Command (TRADOC) requirements to develop a revolutionary war fighting capability that is affordable, moves the dismounted warrior into the 21st century, and achieves a First Unit Equipped by 4th quarter FY2000. The new strategy also achieves the goal of providing a more capable system at an earlier date. By establishing a single consolidated dismounted warrior system program, duplicative system design efforts were eliminated. There is no longer an interim system followed by an objective system, rather, a single system will be fielded. Components will be upgraded through technology insertion into the Land Warrior (LW) System.

Technical Background and Approach

At the conclusion of Phase 2 of the Generation II (GEN II) Program, the Army made a decision to revise the program direction. 21 CLW/GEN II was restructured and renamed FXXI LW. The FXXI LW 6.3 ATD Program is complementary to the Army's LW 6.5 EMD Program being managed by PM Soldier. FXXI LW will pursue evolutionary advanced technology developments at the component level and integration of those technology upgrades into the LW system architecture, and revolutionary enhancements to the LW System. 21 Century Land Warrior (CLW) Program elements are included in the evolutionary category. This strategy will accelerate the fielding of technology upgrades and ensure the U.S. maintains a global technology overmatch for dismounted warrior combat systems. FXXI LW will also pursue technology efforts to help reduce the risks associated with fielding the baseline LW system on schedule. Modeling and simulation will be used to evaluate FXXI LW performance characteristics such as survivability and lethality. Constructive system level modeling, virtual simulations and other

tools will be used to examine the contribution of FXXI LW capabilities to future military organizations engaged in force on force combat engagements.

Summary of Prior and Current Year's Work

Phases I and II of the GEN II Program were successfully completed. The program culminated in the building and demonstration of two full system physical and functional prototypes. Data collected from numerous user evaluations will prove to be valuable design considerations for FXXI LW, LW, and all future dismounted warrior systems.

Planned Work

The GEN II Program currently is transitioning to reflect the new acquisition strategy. The contract is being modified to incorporate the FXXI LW SOW.

As a key participant in the Land Warrior Technical Insertion (TI), Integrated Product Team (IPT), FXXI LW will be identifying, assessing, and qualifying potential technology candidates. The FXXI LW technology teams will interact with the TI IPT to develop formal insertion plans and recommendations.

Begin planning Early User Test (EUT).

Transition Plan

The consolidation of dismounted warrior programs has resulted in the need for close interaction between the LW EMD Program and the S&T program, FXXI LW, to ensure that technology components developed on the FXXI LW program will be compatible with the LW system architecture. A technology transition plan will be developed for each technology insertion component that is being developed in support of the LW System. Components/upgrades demonstrated during S&T that meet previously agreed upon exit criteria, including an analysis of cost and operational effectiveness, will transition to EMD. Prior to insertion into the LW production program, these components/upgrades will undergo appropriate manufacturing development and developmental and operational testing. Upon successful completion of formal testing, the program will move quickly to a MS III production decision.

Relationship to Other Programs

The Soldier Integrated Protective Ensemble (SIPE) ATD project demonstrated the enhanced capabilities that could be achieved through a modular, integrated fighting system for the dismounted warrior. In its wake, two dismounted warrior systems were initiated: The LW acquisition program was structured to capitalize on existing/mature technologies so that the enhanced capabilities of the system could be provided to a dismounted infantry division by the turn of the century. The GEN II ATD was established to demonstrate an advanced system and to integrate all components of the 21CLW S&T Program. The intent of both programs was to leverage appropriate technologies in a timely manner to enhance dismounted warrior capabilities.

With the consolidation of the two dismounted warrior programs, FXXI LW maintains its legacy relationship with SIPE and GEN II, while establishing a more complementary relationship with LW EMD.

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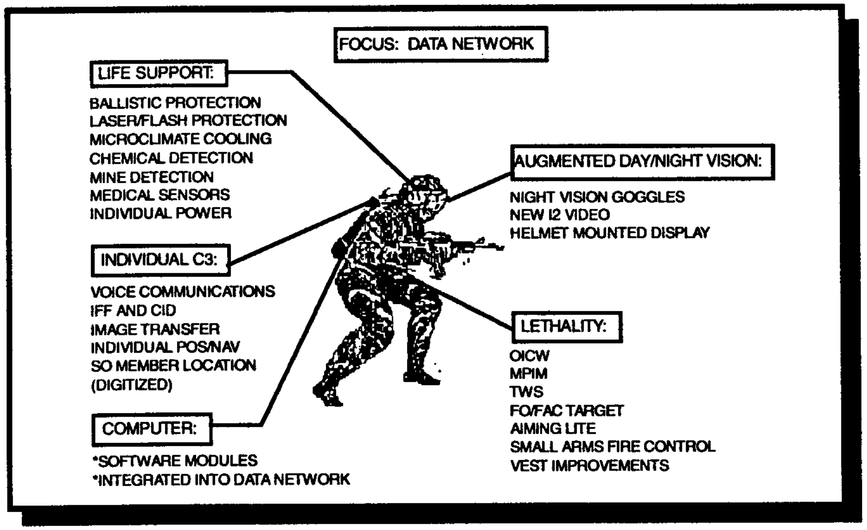
FORCE XXI LAND WARRIOR



OBJECTIVE:
- DEVELOP AND DEMONSTRATE TECHNOLOGIES FOR INSERTION INTO FORCE XXI LAND WARRIOR

CAPABILITIES:
- IMPROVED LIGHTWEIGHT BODY ARMOR (R-Q2)
- INTEROPERABLE IMBEDDED FOR ALL COMBAT SYSTEMS (Y-Q1)
- ENHANCED REPRESENTATION OF INDIVIDUAL SOLDIER/MARINE IN CONSTRUCTIVE AND VIRTUAL SIMULATION (Y-Q2)
- BATTLEFIELD VISUALIZATION SYSTEM (Y-Q2)

APPROACH:
- SOLDIER/MARINE WITH ENSEMBLE AS A SYSTEM
- MORE EFFECTIVE TARGET IDENTIFICATION, LOCATION, ENGAGEMENT
- COMPACT SENSORS AND COMMUNICATION
- M&S AND ADV. WARFARE EXPERIMENT
- DEMONSTRATE NEAR-TERM POTENTIAL, WHILE EVOLVING MID-TERM CAPABILITIES
- BREAK OUT SUB-SYSTEMS FOR EARLY FIELDING
- JOINT - ARMY LEAD PROGRAM

PERFORMERS:
- NRDEC, ARDEC, NVEOS, CECOM
- MOTOROLA, HUGHES

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
INTEGRATED HEAD GEAR ASSESSMENT	▲			
INDIVIDUAL SOLDIER COMPUTER RADIO ASSESSMENT	▲			
PROTECTIVE SUBSYSTEM ASSESSMENT	▲			
LAND WARRIOR INTEGRATION	▲	△		
OITE			△ △	
MS - III				△

TRANSITION:
- PM - APM MARINE/US ARMY - PM SOLDIER

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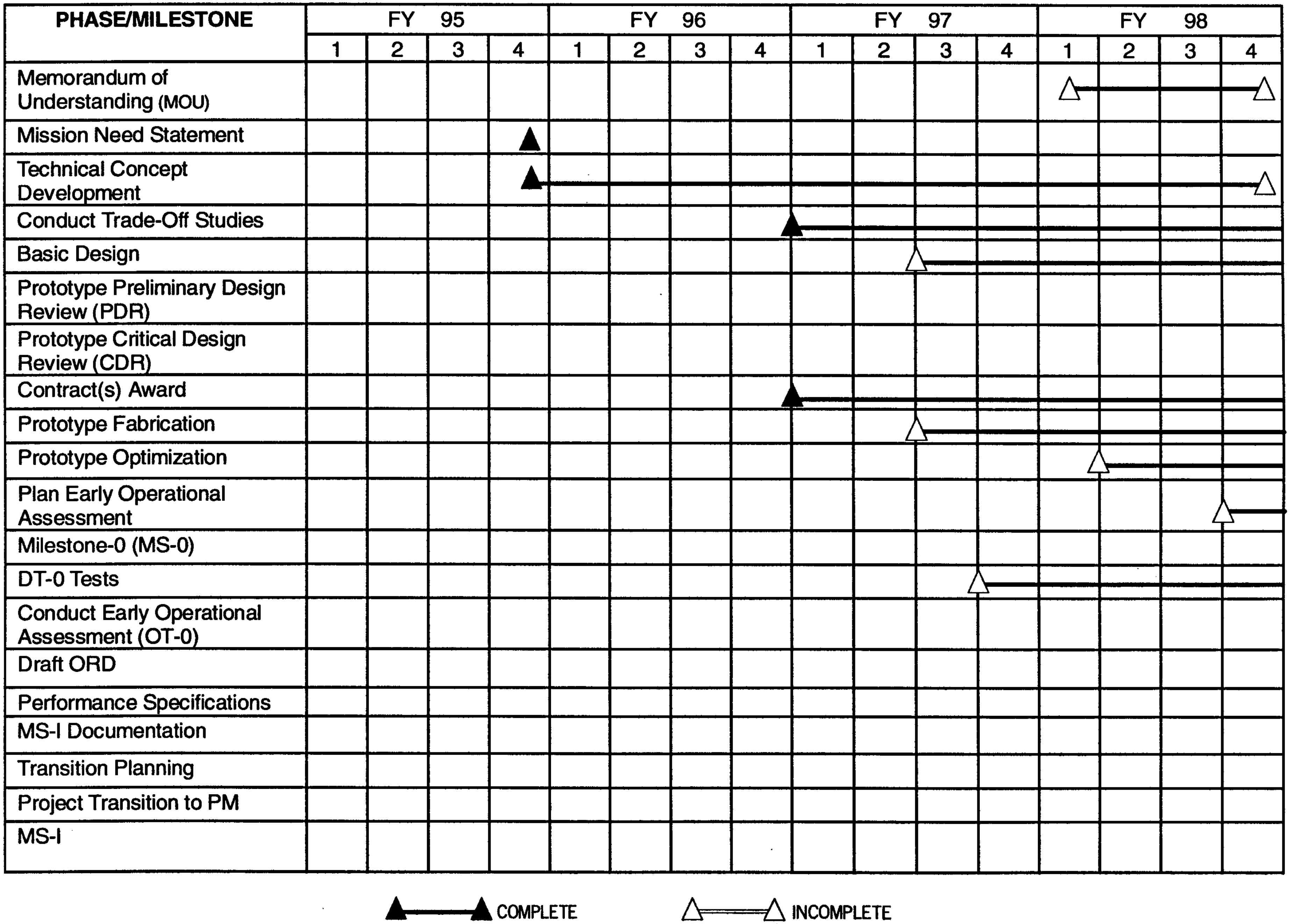
FORCE XXI LAND WARRIOR (FXXI LW) ATD MILESTONES



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ATD 4. ADVANCED LIGHTWEIGHT GROUND WEAPONRY (ALGW)

Problem/Deficiency/Opportunity

In order to successfully execute the OMFTS concept, Marine combat forces will require greater combat effectiveness over larger sectors of the battlespace than is now possible. Marine ground weapons systems today lack mobility because they are heavy, are costly to employ, and impose a significant logistical burden thereby hindering manueverability courses of action available to the tactical commander. Current ground weaponry technologies simply do not allow the range effectiveness and operational suitability required by the OMFTS concept.

The future battlefield will require highly lethal and mobile infantry units. Lightweight and durable weapon systems with improved effectiveness (range, lethality, accuracy) are needed by Marine Combat Forces.

Technical Objective/Expected Payoff

The objective of the ALGW ATD project is to develop and demonstrate new technologies and system concepts that enhance and improve Marine Corps weapons and/or weapon systems. The development and integration of these technologies must increase the effectiveness and lethality while decreasing weight, cost, and logistical requirements of ground weaponry.

Technical Background and Approach

The approach is to conduct the weaponry, warhead, sighting, and other technology demonstrations each with unique objectives, deliverables, and benefits to be investigated and evaluated, both individually and combined, leading to a top level demonstration. Parallel simulations will quantify technical and operational effectiveness of the individual and combined demonstrations. An intermediate demonstration of features developed to that point will take place beginning in the fourth quarter FY97. The final and total demonstration of all elements is planned for the second quarter FY02. Simulation, using both constructive and distributed interactive models, will play an important role in the overall technology development effort, especially the design. The early use of IPTs will ensure a relevant and affordable system in production.

Summary of Prior and Current Year's Work

This project is an FY97 new start.

Planned Work

Begin concept designs and individual technology developments.

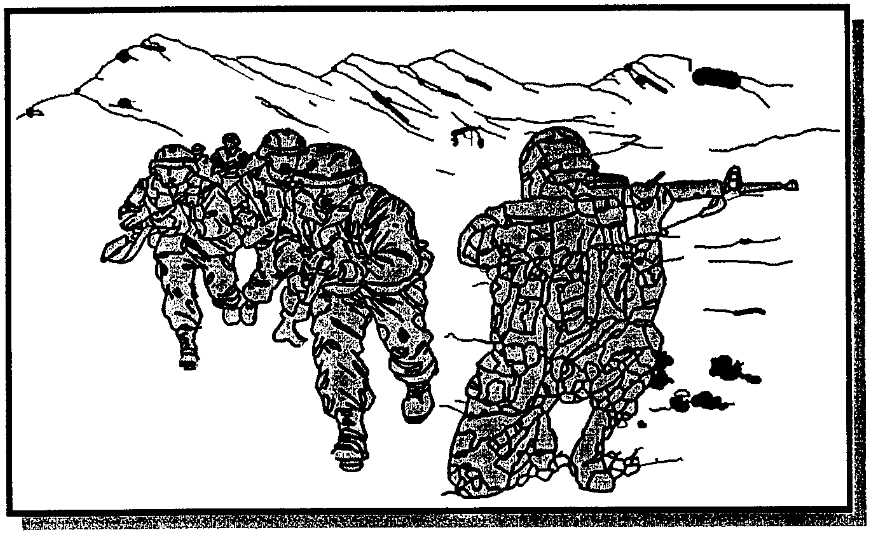
Transition Plan

This ATD project will provide the design and performance data base for the smooth transition into the DEM/VAL phase of projects being transitioned to the PM Ground Weapons, MARCORSYSCOM.

Relationship to Other Programs

The proposed effort will incorporate advances made from considerable investment and progress under Army, Marine, and Marine Corps programs.

ADVANCED LIGHTWEIGHT GROUND WEAPONRY (ALGW)



OBJECTIVE:
DEMONSTRATE TECHNOLOGIES LEADING TO INCREASED RANGE, LETHALITY AND ACCURACY OF WEAPONS SYSTEMS

CAPABILITIES:
- DEFENSIVE WEAPONS CAPABILITY (G-Q1)
- INCREASE RANGE (G-Q1)
- INCREASE SHOOTER MOBILITY (G-Q2)
- FIRST ROUND ON TARGET (G-Q2)

APPROACH:
- SURVEY TECHNOLOGY EFFORTS (RFI, BAA)
- INTEGRATE SUBSYSTEMS INTO SINGLE, LIGHTWEIGHT ENSEMBLES
- DEMONSTRATE AND EVALUATE NEW AND EMERGING TECHNOLOGIES
- LEVERAGE ARMY, OTHER DOD, NON-DOD TECHNOLOGIES
- JOINT EFFORTS WITH ARMY

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
DEFINE TECHNICAL CONCEPTS	▲	△	△	△
120MM AUTOLOADER DEMO	▲ ▲			
BREACHING DEVELOPMENT		△	△	

PERFORMERS:
- NSWCDD, U.S. ARMY ARDEC
- AAI, ALLIANT TECH

TRANSITION:
- PM GROUND WEAPONS, JSSAP

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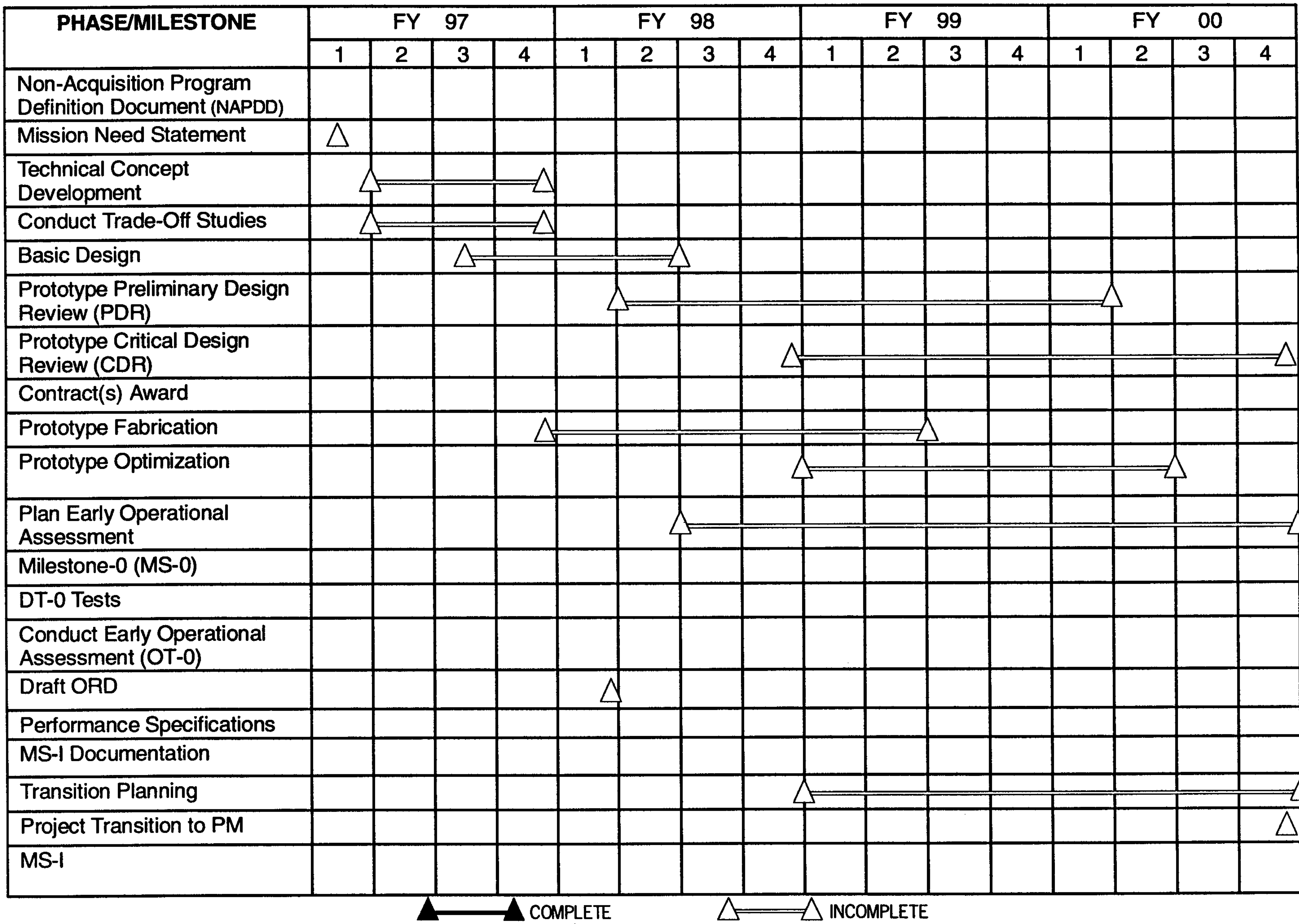
ADVANCED LIGHTWEIGHT GROUND WEAPONRY (ALGW) ATD MILESTONES



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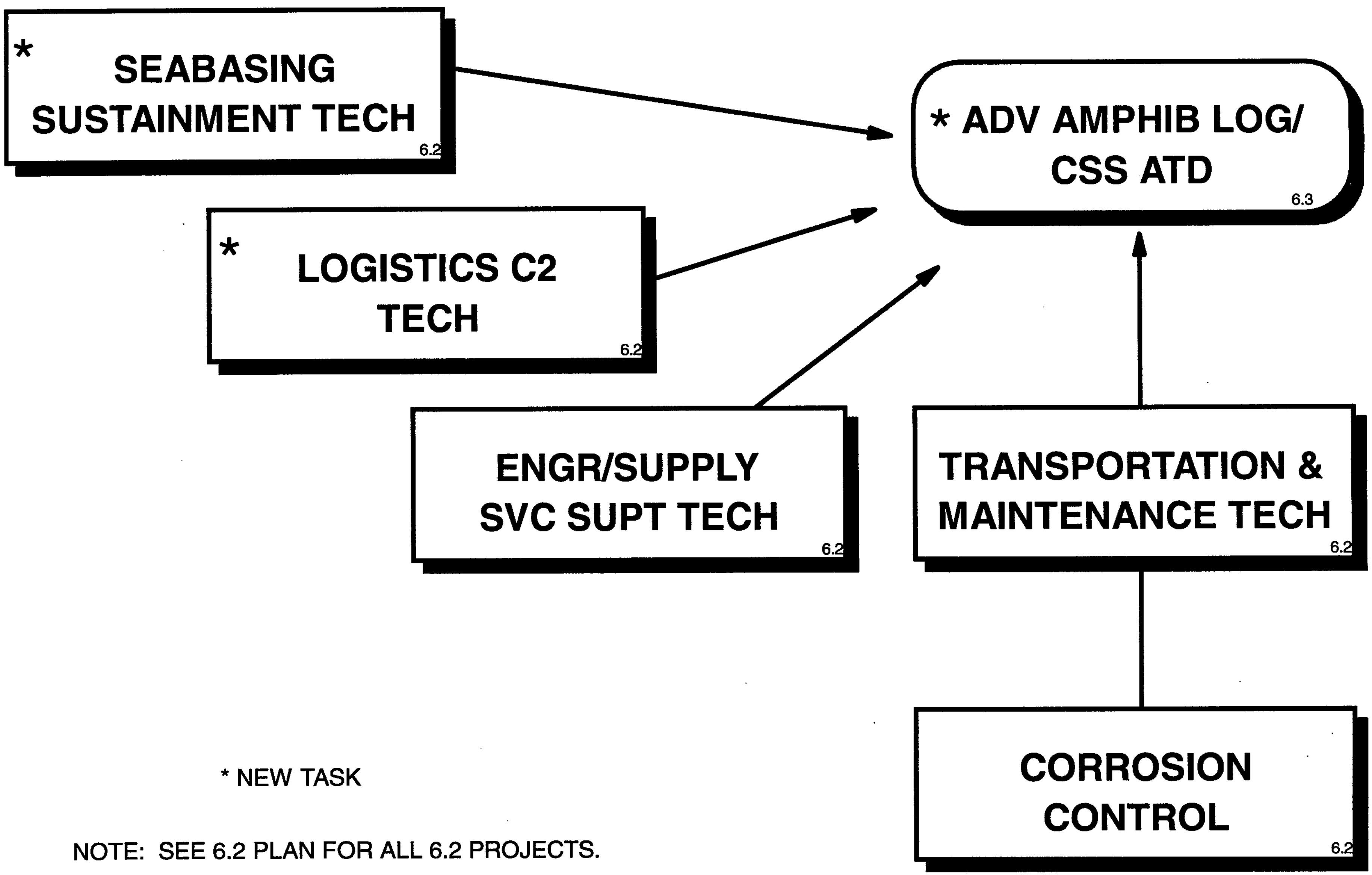
COMBAT SERVICE SUPPORT IMPERATIVE



* NEW TASK

NOTE: SEE 6.2 PLAN FOR ALL 6.2 PROJECTS.

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Imperative Title: COMBAT SERVICE SUPPORT

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ATD 1. ADVANCED AMPHIBIOUS LOGISTICS / COMBAT SERVICE SUPPORT (AAL/CSS)

Problem/Deficiency/Opportunity

Radio Tracking Technologies (RTT). A substantial quantity of critical equipment, material, and containers were lost, misplaced, or misdirected during Desert Shield/Storm. In addition, more than half of all containers sent there had to be re-opened to determine their contents. Emerging concepts such as OMFTS will further complicate locating, recording, and tracking of all classes of supply. Technologies are emerging which have potential to efficiently track materials; however, the state-of-the art technology is expensive, has limited range and only operates in benign environments. The RTT task will further develop and enhance the state-of-the-art to support a wider range of military operations.

Combat Service Support Command and Control (CSSC2). Currently, there are no automated Marine Corps information systems capable of providing logistics command and control. The collection, processing and integration of operational logistics data for planning and execution of logistics tasks and functions is a manual, paper-based process with limited automated support, information exchange and mobility. The present MAGTF II/Logistics Automated Information Systems (LOGAIS) family of systems and locally developed systems partially satisfy FMF requirements for automated support of CSS operations and planning. Critical logistics information, situation maps and overlays are manually tabulated and displayed on status boards. The development of logistic estimates for planning and course of action analysis is limited to the capabilities of logisticians to provide a manual analyses of logistics feasibility. The other combat operations elements (tactical operations, intelligence, fire support and air operations/defense) are rapidly automating those critical tasks and functions that support the commander. Logisticians cannot support the commander with responsive and flexible CSS operations planning and execution that is synchronized with the other combat operations systems. Emerging concepts such as OMFTS will stress and complicate the management and operations of CSS that will be predominately seabased. The CSSC2 task will exploit emerging technologies and develop operational concepts to enhance logistician CSS to the MAGTF.

Technical Objective/Expected Payoff

RTT Purpose. The initial objective of the RTT task is to develop, demonstrate, and transition RTT as an effective and affordable technology for locating, tracking, and identifying military assets across the full spectrum of military operational environments.

RTT Payoffs. The use of this technology in future operational systems will provide the capability to autonomously locate and manifest supplies and equipment. When integrated with existing or projected C2 and LOGAIS, RTT will facilitate a more responsive and precise logistics system.

The expected payoff from full implementation of this technology is a reduction of 50 to 75 percent in labor and 30 to 50 percent in cost related to excess material and supplies sent to the field. Estimated payback time is nine months.

Potential uses of this technology include integration with Command, Control, Communications, Computers, and Intelligence (C4I) and the following: Inventory; Logistics Tracking; Special Operations; High Interest/High Value Assets; C2; Asset Recovery; IFF/Combat ID; and, Reconnaissance.

This radio frequency identification (RFID) technology has significant dual-use and commercialization potential. At the present time, several large commercial developers are maturing this technology for private and military use. It is believed that RFID technology will find increasing application in the areas of inventory control and accountability, tracking of logistics assets, medical, maintenance, and in-process flow control.

CSSC2 Purpose. The purpose of the CSSC2 effort will be to demonstrate technology applicable to providing combat service support planning and execution tools to the operational MAGTF CSS Elements (CSSE), specifically at the CSS Detachment (CSSD) level. These technologies must be able to significantly enhance the CSS capabilities for traditional amphibious assault and the Maritime Prepositioning Force (MPF) operations and address OMFTS CSS requirements. The primary focus will be on the development of planning and execution tools for each of the six functions of CSS. A systems approach to the CSSC2 project will incorporate maturing technologies to enhance all functional areas of CSS and CSSC2.

The objective is to develop a set of advanced tools for CSS execution within each CSS functional area. In order to minimize life-cycle costs and improve interoperability, the CSSC2 advanced tools will be developed as part of the MAGTF C4I Software Baseline (MSBL) utilizing the common core of services of Digital Information Interface (DII) COE and the GCCS.

CSSC2 Payoffs. The CSSC2 functionality of the MSBL will provide the C2 support to improve the planning and execution of CSS operations. CSSC2 will consolidate and display vast quantities of data required to enhance situation awareness of the CSS posture and readiness. The CSSC2 segments will provide strategic and tactical commanders with critical and timely information about the six functional areas of CSS. CSSC2 will provide a user-friendly means of access to combat readiness information, resource management, CSS course of action development and analysis, and mission execution tools.

CSSC2 will target support for the logistician from the battalion/squadron level up to the Marine Forces (MARFOR) level. The advanced tools will reduce the logistician's planning cycle for rapid operations planning, keeping the coordinated staff planning actions in step and complementary.

The CSSC2 effort will focus on the development of CSS advanced technologies at the CSSD, Marine Expeditionary Unit (MEU) Service Support Group (MSSG), maneuver unit, aviation maintenance management, and Marine Wing Support Squadron levels. Successfully

demonstrated technologies will transition to the Demonstration and Validation (DEM/VAL) phase of the acquisition cycle. A more flexible, versatile, and responsive CSS system is the primary goal of the CSSC2 project.

Technical Background and Approach

RTT Background.

(1) Emerging OMFTS doctrine suggests that future Marine Corps amphibious operations will be launched from a sea base located some distance over the horizon (OTH) into multiple enemy centers of gravity inland. This concept is in direct support of the white paper "Forward ... From the Sea". The purpose of the AAL/CSS ATD is to demonstrate concepts for providing integral CSS to these forces. In addition, these technologies will enhance CSS capability for forces operating in a traditional amphibious assault scenario or in Support and Stability Operations (SSO). A systems approach will incorporate maturing logistics technologies to enhance all functional areas of CSS. The first mature technology to be demonstrated will be RTT. Other technologies to follow as part of a systematic approach are: Expeditionary Engineering Technologies (EET), Expeditionary Bulk Liquid Technologies (EBLT), and Expeditionary Cargo Packaging Technologies (ECPT).

(2) RTT, using Micro-circuit Technology in Logistics Applications (MITLA), was chosen as a candidate for the higher end management system to the existing Logistics Marking and Reading System (LOGMARS). The LOGMARS utilizes bar codes and legacy databases to record and track military assets. As experienced during Desert Storm/Shield, the LOGMARS was not adequate in an expansive and chaotic logistics environment. For example, over 22,000 of the 45,000 containers sent to the Persian Gulf had to be opened and completely inventoried to determine the contents. This process was very labor intensive and time consuming.

(3) In FY93, the Naval Facilities Engineering Service Center (NFESC), Port Hueneme, CA, under the Marine Corps sponsored Advanced Expeditionary CSS (AECSS) 6.2 Program, introduced the RTT concepts. Expanding on commercially available MITLA products, NFESC team members conceptualized a four tier architecture capable of providing Total Asset Visibility (TAV) in the Marine environment. The goal of the entire architecture was to provide a system that would facilitate automated, real time inventory from the field. The NFESC successfully demonstrated the technical feasibility of this architecture during FY95. As a result of this successful 6.2, an ATD task was embarked upon to further develop the RTT system.

RTT Approach. The technical approach of this the RTT effort is to: support the DOD concept of TAV; demonstrate what critical technologies are required to make TAV autonomous, reliable, maintainable, and cost effective; and, develop the engineering data required for possible further scale-up of the process using the following developmental steps.

Technical concept development. Continue to refine and develop RTT concepts and protocols, as necessary, and continue to explore multiple candidate technologies for assured asset location, tracking, and identification to include communications. This will be done with close coordination with the First Force Service Support Group (FSSG) located at Camp Pendleton, CA.

Hardware design and fabrication. The candidate system is comprised mostly of commercially available or newly developed products. This phase will include software interface design and combined integration of commercial products.

Testing and evaluation. This technology will be tested both in the laboratory for operational performance, in the field for environmental dependance, and, finally, during an operational Combined Arms Exercise (CAX) in order to collect data across a spectrum of DT/OT. The testing and evaluation will be focused on the goals of providing more timely information to the FSSG, MAGTF, and Battalion and Battery Commanders. Other goals support the reduction in manpower and the accuracy to which inventory control can be exercised.

Demonstration. This technology will be demonstrated in an operational environment. The demonstration scenario is to track the transportation of principle end items (PEI) and materials from a rear FSSG to the forward FSSG and then through distribution to the combat elements during an operational CAX.

System Integration. Integration will be done, as required, particularly with C4I, LOGAIS, and other legacy database systems. Long term system development goals are to support the Marine goal of C2 with RTT hardware suites supplying object oriented data.

The major technical challenges are: protocol development and integration; communications platform interface; and, frequency bandwidth availability.

Available technologies will be leveraged, where possible, during development and planning.

CSSC2 Background. The CSSC2 effort will focus on the development and demonstration of advance tools for CSS. In order to ensure compliance with CSS doctrine, the tools will be developed within each CSS functional area and will adhere to the seven principles of CSS. Military operational logistics is that portion of the logistical process concerned specifically with supporting the operating forces. Providing the means for sustaining combat forces in the conduct of military operations is the concern of the operational logistician and include: acquisition, storage, movement, distribution, maintenance, evacuation, and disposal of materiel; movement, evacuation, and hospitalization of personnel; acquisition or construction, maintenance, operation, and disposal of facilities; and, acquisition or furnishing of services.

CSSC2 Approach. The technical approach to the CSSC2 task is to support the Marine Corps concept of CSS to deployed MAGTF forces for all CSS functions, demonstrate what

critical technologies are required to make CSSC2 reliable and maintainable, and develop the engineering data required for possible further enhancements of the CSS processes and activities.

Technical concept development. A notional technical architecture for CSSC2 will be developed. The technical architecture will be the cornerstone for the CSSC2 development and demonstration. The CSSC2, LOGAIS, and joint system information exchange requirements will be developed and defined. Based on the information exchange requirements, a C2 and communications architecture will be developed to support systems interface development, CSSC2 employment, and acquisition decisions.

Hardware and software design and fabrication. The CSSC2 system will utilize mostly tactical and fielded hardware that is performing specific non-CSS tasks and functions. The utilization of the CSS functionality on a common C2 platform will enhance the flexibility of command and staff actions. This principle activity will include software design and integration.

Testing and evaluation. The CSSC2 technologies will be tested in the development laboratory for system stability, in the field for operational performance, and operationally demonstrated for collection of evaluation data. The testing and evaluation will focus on the goals of providing advanced CSS tools to the unit logistician and decision support aids for the unit commander.

Demonstration. The CSSC2 technology will be demonstrated in an operational environment. The demonstration scenario is to exercise the seven principles of CSS in a field environment, the organization and structure for a CSS Operations Center (CSSOC), and the quality of logistics advanced management tools and decision aids. A strawman will be developed to establish objectives, procedures, organization, and funding for the accomplishment of user/technical evaluations and demonstrations. The key to a successful demonstration is feedback from these evaluations so that changes and enhancements to CSSC2 may be planned and incorporated during subsequent fiscal year objectives.

System integration. Integration will be implemented for a CSSC2 segment of the MSBL, LOGAIS stand-a-lone and legacy systems, and other combat operations C2 systems. Further, critical CSSC2 elements of information will be identified for the purpose of implementing the interface and integration with supported systems.

Summary of Prior and Current Year's Work

RTT. The RTT project transitioned from 6.2 in FY96. The 6.2 phase of RTT, in direct support of the AECSS project and OMFTS, resulted in the four product advances described below:

GeoTag. Geotag is a tag that can communicate with a satellite or aerial platform. GeoTag offers the optimal solution to the problem of In-Transit-Visibility (ITV). Via GeoTag, high value military assets such as weapon systems or munitions can be monitored and located

while in transit. GeoTag can provide autonomous location and identification data (as well as secondary information such as manifest, owner, destination, etc.) in near real-time wherever the asset is located worldwide. GeoTag can also be utilized in the future to determine battlefield readiness during debarkation or troop movement in theater. The standard Seal Tag is the baseline configuration for the GeoTag. In other words, a modular Seal Tag having the capability to plug-in a satellite transceiver or GPS receiver is essentially a GeoTag.

Data Base Engine (DBE) Tag. The DBE tag incorporates both a data base and data base operator within the tag. The DBE enables the manifest tag to search its own data base for contents. For example, using the DBE, an operator can seek out an object by placing a "Where Is?" command from his hand held interrogator. All container DBE tags that are within 200 feet will then search their manifest for that item. If contained within a particular container, that container will report its position along with directions to the container. The DBE tag also provides "manifesting on the fly" capability which allows for rapid reconfiguration and recording of supplies at a sea base, port, or landing zone.

Wireless link Interrogator Network (WIN). The WIN combines spread spectrum RF technology with adaptive routing algorithms. Previously, the interrogator network was hard wired making it difficult to rapidly deploy and obtain battlefield coverage. The WIN makes it possible to have tens of square miles of coverage.

Radio Label (Radel). The Radel is an inexpensive tag that can be placed on objects within a container. The Radel is the integral part of accomplishing In-the-Box Visibility (IBV) and is similar in size to a LOGMARS bar code label but eliminates the requirement to scan. Through the use of Radels, tagged assets will automatically update the inventory manifest (stored within another tag) as the object enters the container. The Radel will also automatically debit the manifest upon issuance of its associated item. This data can then be transferred via RF from the container to the appropriate supply managers. The Radel has the capabilities of a deployable, autonomous LOGMARS and will eventually be expanded to include the smallest assets in the supply system.

These technology advances are laying the ground work for a solution to the military TAV problem. This solution builds upon a layered architecture in which appropriately featured tags are positioned throughout the logistics chain. Each tag offers enough intelligence at each node to manage the flow of information.

CSSC2. This is a new start for Fiscal Year 1997.

Planned Work

RTT. The RTT ATD effort commenced in FY96 and will be completed during FY97. The first tasks performed in FY96 were coordination efforts for site selection and operational exercises, interface selection and development, and coordination with the FMF.

In FY97, a review will be performed to verify that all of the latest information on RTT research, development, and demonstration programs is in hand. Site selections will then be performed and coordination efforts begun. Communications platform interface requirements will be developed for existing and emerging C2 systems and candidates for battlefield platforms will be identified. Efforts will also include the beginning stages of the management without exception software necessary to accomplish In-Process Visibility (IPV) for the maintenance and repair process. Protocol addressing schemes associated with Internet and C4I interface will be reviewed and tested. Finally, a demonstration, in conjunction with a CAX, will be performed.

During execution year+1, systems demonstrated in the previous year will continue to be evaluated and refined. In addition, legacy data base interfaces will be created, including MAGTF II/LOGAIS. Finally, year+2, a large scale demonstration will be conducted combining, from the previous year, ITV and FSSG interest in the maintenance and repair process. This demonstration will be conducted in conjunction with a CAX or other operational exercise. Once the final site selection has been made (prior to the end of the first quarter), site hardware and software installation will begin. All the software and hardware will be installed to include the tagging of items and training of appropriate Marine personnel. The ATD effort will commence with a large scale systems demonstration with a final demonstration report being issued by the end of the fourth quarter FY97. Following completion of the test program, a final report will be prepared. The final report will contain the results of operational tests, the input from customers and regulators, and model transition documents. Following completion of the program, the RTT system may be turned over to local Marine Corps personnel for operation or moved to other locations for exercises and additional testing.

CSSC2. The proposed CSSC2 effort is scheduled to commence in FY97 and be completed by the end of FY99. The first task to be performed will be the development of a CSSC2 technical architecture, with supporting communication architecture, and the evaluation of joint and service CSS initiatives for CSSC2 exploitable functionality. The ATD plan evaluation phase will be coordinated and scheduled with the FMF. The following paragraphs will address potential CSS segments and associated technologies for this project.

The Rapid Request Tracking System (RRTS) segment of the MSBL will be the first technology to address CSSC2 requirements. The RRTS will provide commanders and their staffs C2 visibility of all CSS rapid request missions involving all commodity areas. Supported commanders pass rapid requests to supporting units/sections and receive feedback on the status of each request. Supporting commanders require the capability to receive, prioritize, task subordinates, and provide status feedback to requesting units. The rapid request segment will be implemented as a standalone capability using Lotus Notes on the PC-Client, but will also exchange data with the CSSC2 tools of the MSBL and Digital Automated Communications Terminal (DACT) using the communications/messaging services.

The MAGTF Allowance List/Combat Essential Items List (MAL/CEIL) segment of the MSBL will provide a means to import, parse, and filter LOGAIS/CSS data into the CSSC2 Database Management System (DBMS). The MAL specifies all technical identifiers and nomenclature required for items that may be tracked by the CSSC2 system. The CEIL provides

the means for the commander to select which actual items will be tracked as combat essential for a given mission. The MAL/CEIL segment is required in support of the visibility and tracking of CSS activities and processing and for adoption of emerging technologies requiring military item identification.

The CSS interface segment will provide an automated interface between CSSC2 tools and multiple CSS/LOGAIS management systems. An analysis will be conducted to determine the appropriate software interface (software interface specification) requirements for CSSC2 and LOGAIS. Interfaces must be provided an efficient means to collect data from other DoD CSS systems.

To support the storage of CSS data from logistics systems, a relational database segment will be developed to provide the database services required to integrate and manage large amounts of CSS data. The Relational DBMS (RDBMS) segment will be implemented using the commercial standard ODBC for database connectivity. ODBC will provide independence from particular database vendors and allow operation with all database products that support the ODBC standard.

The Pointer segment will employ a set of tools to provide a consolidated and detailed view of logistics and CSS data and status. Pointer will serve as the C4I bridge into critical LOGAIS/CSS management systems data. The operator will be able to display standardized information on the status of ammunition, fuel, medical, personnel, equipment, maintenance, and transportation as well as other supplies and services for a unit or force. A user friendly set of input and status forms will be provided for rapid data entry and recall. The Pointer segment will provide the primary infrastructure for the entire CSSC2 advanced tool set.

The Unit Task Organization (UTO) segment will provide a set of graphical tools to rapidly create and manipulate task organizations complete with personnel, supplies, equipment, and combat readiness status. Using a folder methodology in conjunction with the CSS Course of Action (COA) tools, multiple UTOs can be created and compared for CSS operational effectiveness.

The CSS COA Analysis (COAA) segment will provide the capability to predict CSS supportability of operational plans using parametric measures of posture, intensity, position, distance, and re-supply. The COAA tool will be used to support the logistician in development of estimates of supportability and the commander in the COA decision making process.

The automation of the CSS functions at the FSSG will provide a basis to model a generic structure and equipment base for a CSSD supporting maneuver organizations or fixed facilities such as airfields and rear area Command, Control, and Communications (C3) nodes. The technical and C3 architectures will guide the development of the standardization. The mobile CSSD will follow in standardization.

The organization for commanding and controlling CSS operations has burdened the FSSG organization with duplication of effort and over tasking of assets. The CSSC2 automation

and near real time oversight of the MAGTF CSS posture and readiness will spawn efficiencies in organization. The CSSOC organization can be formalized for validation by Headquarters, Marine Corps (HQMC) (I&L, and Manpower) and implementation by Marine Corps Combat Development Command (MCCDC).

The CSSC2 task will produce innovations to the employment and execution of CSS on the battlefield. The future calls for the emerging OMFTS concept to govern the employment of forces on the modern battlefield. The seabased CSS to support this concept will require flexibility and ready responsiveness. The CSSC2 demonstration will position the CSSC2 systems to leap into the battlefield of the future with rapid, efficient, and responsive support to the war fighter. The CSSC2 effort will produce a formalized CSS CONOP.

Transition Plan

RTT. The strategy proposed for implementing the RTT capability will be to fine tune exploratory developed hardware and software, integrate with MAGTF II/LOGAIS software and C4I, and prepare documentation that permits the Marine Corps to implement this innovative new technology throughout the Marine Corps.

The preferred transition strategy is to implement shared savings contracts with private companies and other services. In this arrangement, each Service would procure the basic components of hardware and software necessary to integrate with existing service legacy systems and mission needs. Cost shared contracts with private companies will be implemented to fine tune already developed technologies at least cost to the government. This technology has already been proven in small scale demonstrations and implemented in several operational exercises.

This project will transition in FY98 to a 6.4 effort with the MARCORSYSCOM PM for C4I systems.

CSSC2. The strategy proposed for implementing the CSSC2 will be to define a CSS technical architecture, develop and exploit existing/evolving CSS C2 software, integrate with MAGTF II/LOGAIS and MAGTF C4I software, and prepare documentation that permits the Marine Corps to implement these CSSC2 advanced tools and structure CSS organizations for more efficient operations.

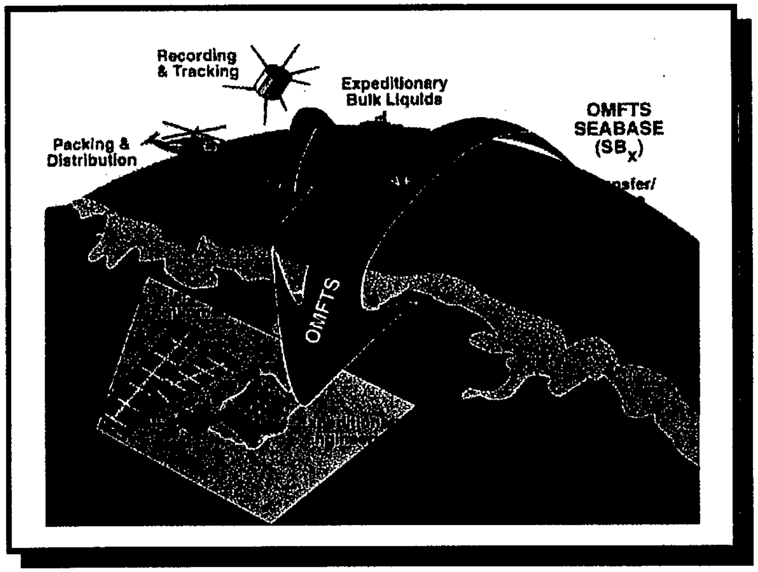
The transitional goal of the CSSC2 project will be to develop CSS functional segments that will have been integrated and fulfill segmentation requirements for the MSBL and in turn the requirements of common operating environment (COE) for the GCCS. This will expedite the program transition, fielding, and implementation of the segments in support of the FMF.

Relationship to Other Programs

RTT. The commercial product line is being utilized and tested by many Service organizations. The Air Force is employing this technology in warehousing functions including an engine rebuild facility at Kelly Air Force Base. The Army utilized this technology in several exercises including "Future Europe Advanced Identification Techniques (AIT)" retrograding munitions from Germany. The Army is sponsoring an ongoing TAV ATD. The DARPA will begin an ATD in FY97. Research efforts to advance both commercial and military use of this technology are supported by the Marines, cooperative development with industry, and are targeted to become a joint development effort.

CSSC2. The Army has an Army Combat Service Support Control System (CSSCS) program which will provide timely situation awareness and force projection information to determine the capability to support current operations and sustain future operations. The CSSCS will rapidly collect, store, analyze, and disseminate critical logistics, medical, financial, and personnel information. The Navy has a Naval Tactical Command Support System (NTCSS) program that is an information technology system for US Navy ships. NTCSS provides the facility to process the full range of transactions associated with sustaining the material and personnel readiness of the ship, which includes aviation maintenance and readiness. It includes the interface to shore based facilities and interfaces to the ship tactical systems providing an integrated view of all information relevant to command and control of the operational unit(s).

ADVANCED AMPHIBIOUS LOGISTICS/COMBAT SERVICE SUPPORT



APPROACH:

- BASKET ATD FOR DEVELOPMENT/DEMO OF MATERIAL SOLUTIONS
- UPFRONT MODELING & SIMULATION TO IDENTIFY KEY TECHNOLOGY DEFICIENCIES FOR SEABASING
- DEVELOP RAPID PROTOTYPE CONCEPTS FOR EARLY USER EVAL AND PRELIMINARY DESIGN
- USE AAL/CSS ATD AS AN INTEGRATION AND TRANSITION ENGINE FOR KEY MATERIEL CONCEPT TECHNICAL INTEGRATION AND TRANSITION RISK REDUCTION

PERFORMING ACTIVITES:

- NFESC, MCTSSA, NSWC CD, NRaD/CECOM

OBJECTIVE:

- DEMONSTRATE TECHNOLGIES APPLICABLE TO PROVIDING LOGISTICS SUSTAINMENT AND CSS SUPPORT FOR OPERATIONAL MANEUVER FROM A SEABASE PLATFORM
- FOCUS ON LOGISTICS INTERFACE: C2, TRANSFER MECHANISMS (SURFACE AND AIR), AND COMBAT CARGO/EMBARKATION
- DIRECT SUPPORT OF CWL SUSTAINMENT EXPERIMENTATION AND TRANSITION PATH

CAPABILITIES:

- AMPHIBIOUS LIFT (DESIGN FOR SEA-BASING, VX AND SBX) (R-Q1)
- NAPPD FY95 -1 APPROVED 22 MAR 96

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
NAPDD APPROVAL	▲			
RESEARCH & TRACKING TECHNOLOGY	▲—▲			
CSSC2 ARCHITECTURE		△—△		
CSSC2 DESIGN & DEMO			△	
LOGISTICS CONTAINER TRANSPORTER			△—	—△
AERIAL RESUPPLY		△—	—	—△

TRANSITION:

- DIR C4I/MCTSSA (PM SOFTWARE)/PM CSS

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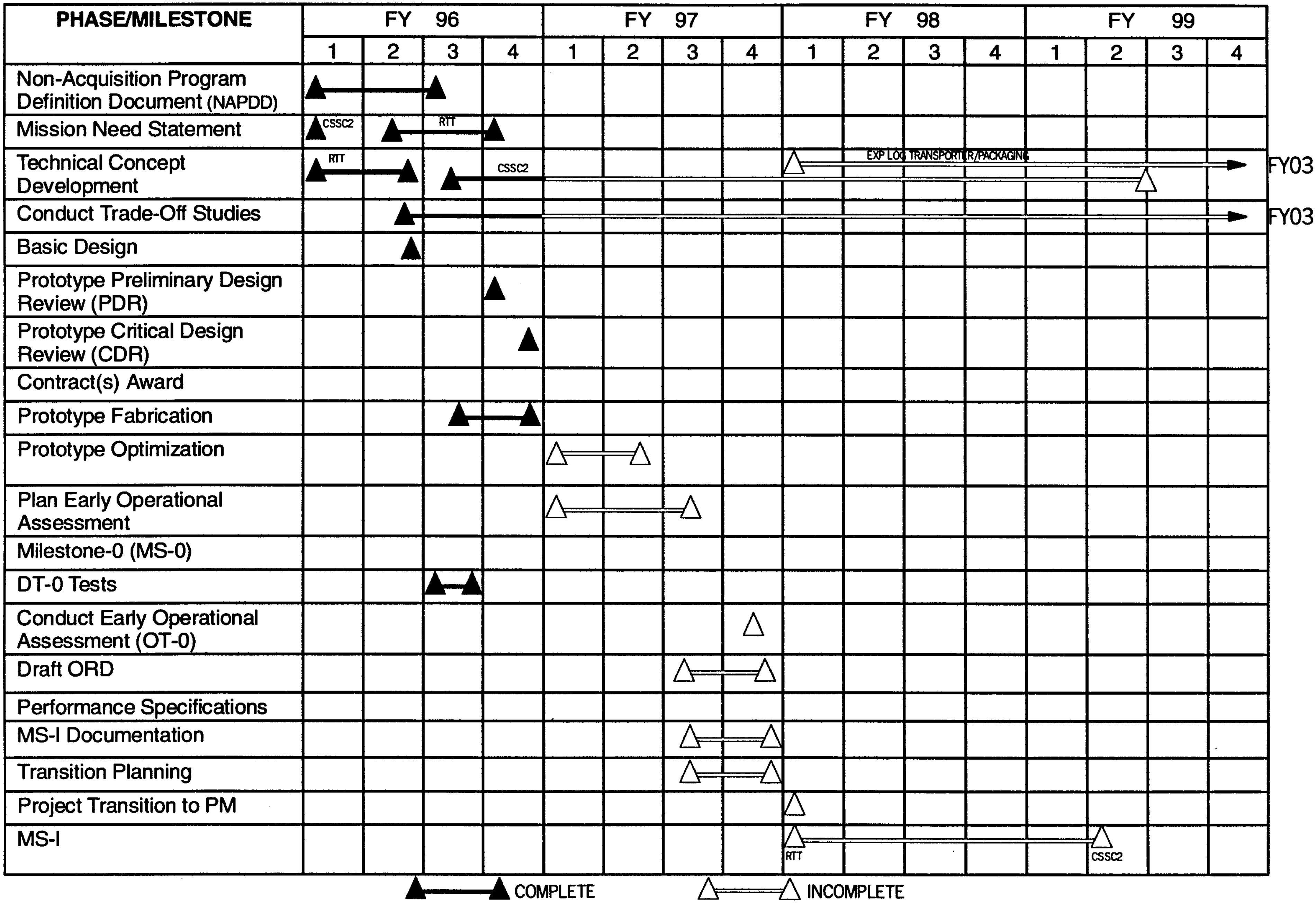
ADVANCED AMPHIBIOUS LOGISTICS/COMBAT SERVICE SUPPORT (AAL/CSS) ATD MILESTONES



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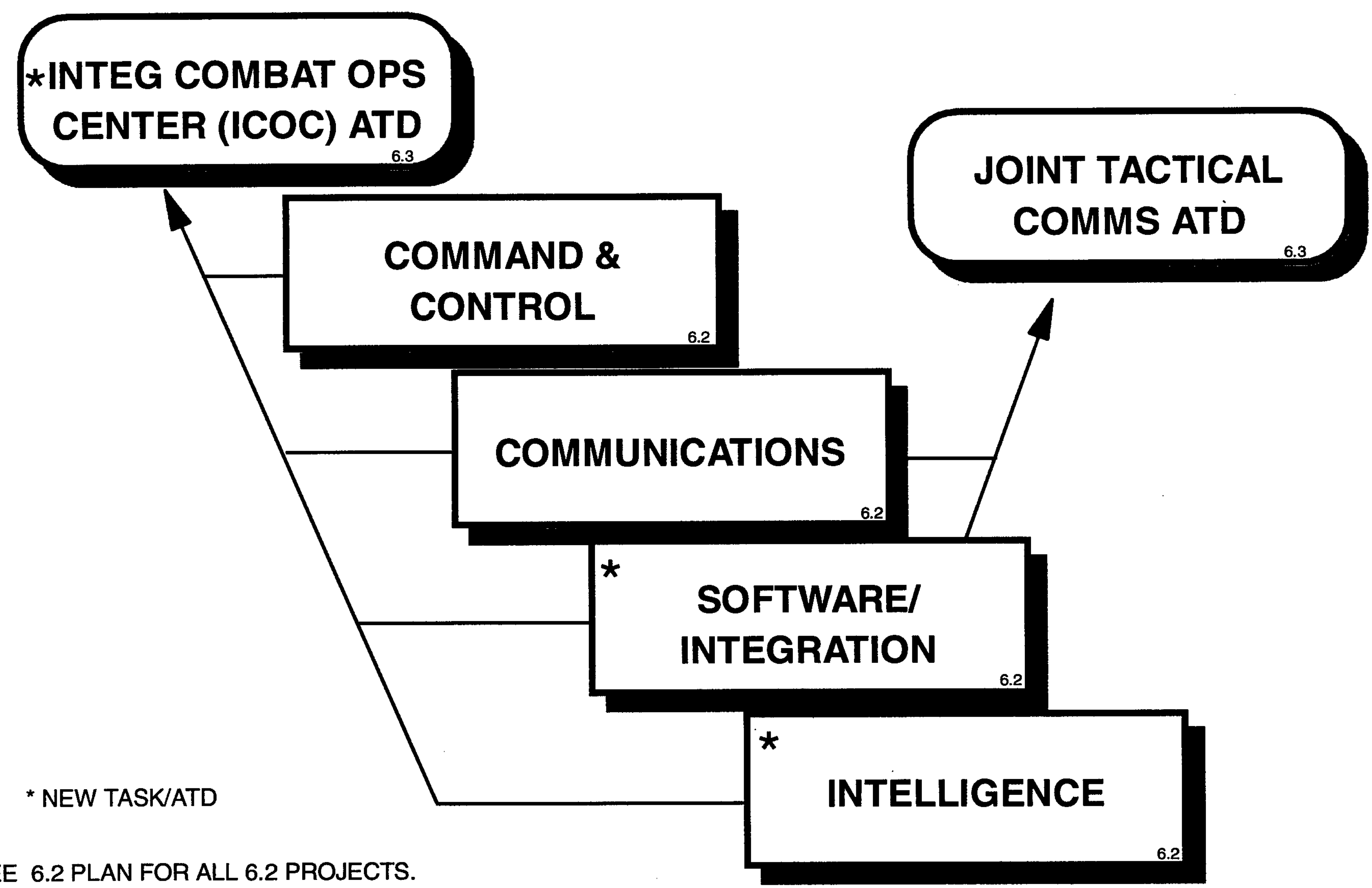
COMMAND AND CONTROL IMPERATIVE



* NEW TASK/ATD

NOTE: SEE 6.2 PLAN FOR ALL 6.2 PROJECTS.

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Imperative Title: COMMAND AND CONTROL

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ATD 1. JOINT TACTICAL COMMUNICATION (JTC)

Problem/Deficiency/Opportunity

Battlefield communication, especially those required to support special operations or tactical units close to the forward edge of the battle area (FEBA), present a special challenge to ensure unit and system survivability in a covert and/or command and control warfare intense environment. A capability is required to permit freedom of operation, in a command, control, and communication (C3) sense, to enhance mission accomplishment and survivability. Presently, multiple radio equipment, which have very limited traffic handling capability, are required to support communications media.

Technical Objective/Expected Payoff

To develop and demonstrate the capabilities of a RF transceiver using Ultra Wideband (UWB) impulse technology. UWB technology has demonstrated unique RF properties which support Low Probability Interception/Detection (LPD) transmissions. The objective of this effort is to apply this technology to a tactical radio which can handle multiple functions, including voice, and low and high data rate transmission.

The expected payoffs of this ATD include: (1) LPD communication for covert operations; (2) situation awareness at all unit levels; (3) enhanced operational and logistical support; and, (4) multi-function, low cost, and small envelope radio communication system.

Technical Background and Approach

UWB impulse technology has been demonstrated in limited applications exhibiting excellent LPD characteristics and the potential for a low cost and small size multi-function radio for tactical units. Under this ATD effort two radio devices will be designed, fabricated, and demonstrated to provide several capabilities. The LDR device will consist of two channels, one for voice communication and the other to support combat ID, beaconing for extraction/location, or tracking. An ATD goal is for the LDR to perform voice and one of the other functions (e.g., combat ID, beaconing, or tracking) simultaneously.

The High Data Rate (HDR) device will provide one of the following functions: (1) a wireless Local Area Network (LAN) capability for command posts; (2) antenna farm remoting - multiplex together the single channel radio data and voice circuits and transmit/receive them to and from the antenna farm; (3) transmission of imagery data from remote sensors; or, (4) single

relay function to extend operational distance or alleviate a non-LOS condition. An ATD goal is for the HDR to incorporate these four functions via a selectable switch.

This ATD effort will be conducted in three phases, each using prototypes suitable for field demonstration: LDR, HDR, and "Upgraded" LDR/HDR developments, respectively. The LDR effort is for a build of 16 units and the HDR is for a build of 8 units. The "upgraded" LDR and HDR units will be enhanced versions of the previous LDR and HDR designs with performance improvements incorporated as a result of any deficiencies or user evaluations and feedback during the prior test and demonstration efforts performed as part of the ATD. It is planned to build and test 32 each of the upgraded LDR units and 16 each of the upgraded HDR units.

Summary of Prior and Current Year's Work

In August 1994, a feasibility demonstration of existing UWB pulse radio technology was supported by the NSWCDD Maneuver Warfare Technology Office, and the Army Unmanned Ground Vehicle Office, under the sponsorship of the MARCORSYSCOM AWT Directorate. NSWCDD also requested that the IEW Directorate (IEWD) of the Army CECOM, Research, Development, and Engineering Center (RDEC) participate in the evaluation of the covertness of this technology during the demo. Based on a favorable report generated by the NSWCDD and the IEWD, MARCORSYSCOM decided to pursue further development of the UWB technology for various applications.

A Non-ACAT Program Definition Document (NAPDD) was prepared by the AWT Directorate and approved by the Commander, MARCORSYSCOM in August 1995. With funding provided by the MARCORSYSCOM, a contract for the development of the UTED was awarded by the Army CECOM in August 1995. The baseline phase of the UTED contract was for the Systems Engineering and Analysis Study for the Low Data Rate (LDR) device and was prepared by the contractor in October 1995. A preliminary design review (PDR) was held on 30 November for the LDR device and the contract option for the development and fabrication of 16 LDR devices was awarded in November 1995.

Planned Work

Follow-on work planned for FY96 includes: programmatic documentation, AWT Tri-annual reviews, and periodic In-Progress Reviews (IPR), as required; planned for completion in FY96 are PDR for the HDR device in March 1996 and a CDR for the LDR device in August 1996. A program management plan for the JTC ATD will also be prepared; develop detailed test plan for LDR device; draft and staff MNS; and, continue to coordinate program with Army CECOM.

Transition Plan

Integrated Logistics Support (ILS) documentation will be drafted in FY98 in preparation for transition to the PM for C4I. Transition of the UTED systems to the PM is planned for FY99 for follow-on development.

Relationship to Other Programs

Coordination is proceeding with Army CECOM to include UTED technology as part of the Personal Communication System (PCS) work being performed in their Digital Battlefield Communication (DBC) ATD.

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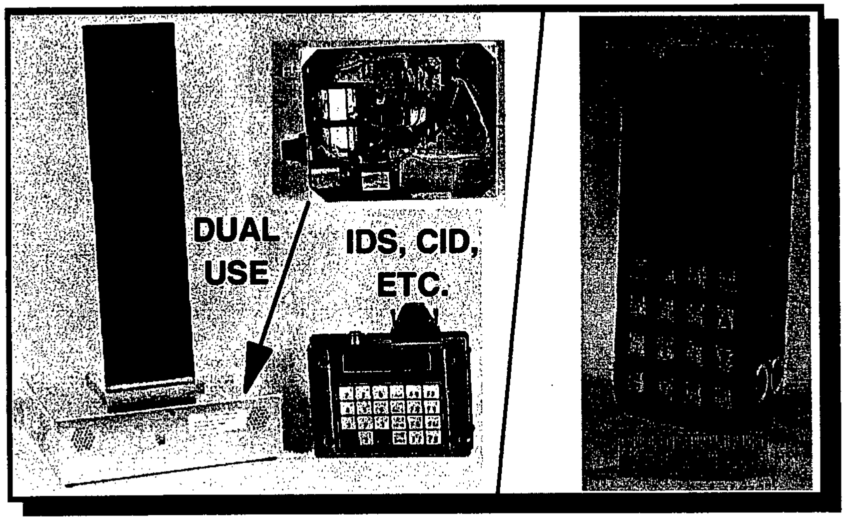
JOINT TACTICAL COMMUNICATIONS



OBJECTIVE:

- DEVELOP AND DEMONSTRATE CAPABILITIES OF AN ENHANCED LPI/LPD DIGITAL COMMUNICATIONS DEVICE BASED ON ULTRA-WIDEBAND (UWB) IMPULSE TECHNOLOGY
- EXPLORE DUAL USE CONCEPTS FOR BEACONING, COMBAT ID, DIGITAL/VOICE, WIRELESS LAN, IDS, ETC.
- SUPPORT EXPERIMENTATION FOR URBAN WARRIOR

CAPABILITIES:
- NAPDD JOINT TACTICAL COMMS ATD, SIGNED 15 FEB 96
- COMMS: COVERT, HIGH SPEED, WORLDWIDE (R-Q1)
- NONOBTRUSIVE ID (R-Q1)
- INDIVIDUAL MARINE/COMBAT VEH TRACKING (R-Q1)
- SIGNATURE REDUCTION (Y-Q1)

APPROACH:

- ESTABLISH JOINT ULTRA-WIDEBAND TECHNOLOGY WORKING GROUP (OSD/INS INTEREST)
- CONTRACT DEVELOPMENT FOR PROTOTYPE ULTRA-WIDEBAND TACTICAL ELECTRONIC DEVICES (UTED) AND TECHNICAL EVALUATION
- USER INPUT/ASSESSMENT AND DEMONSTRATION OF LOW DATA RATE (LDR) AND HIGH DATA RATE (HDR) DEVICES.
- PROVIDE EXPERIMENTATION SUPPORT TO URBAN WARRIOR

PERFORMERS:
- LAB: CECOM (S&TCD, IEWD), NRaD
- CONTRACTORS: K&B ENGINEERING, INC., TDSI, INC.

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
DEVELOP LDR UTED DEVICE	▲———	△		
LDR DT-0 TESTS		△		
DEVELOP HDR UTED DEVICE		△———△		
HDR DT-0 TESTS		△		
DEVELOP UPGRADED LDR/HDR DEVICES		△———	———△	
UP LDR/HDR OT-0 TESTS				△

TRANSITION:
- CECOM, DIR C4I (PM COMMS), 21ST CLW

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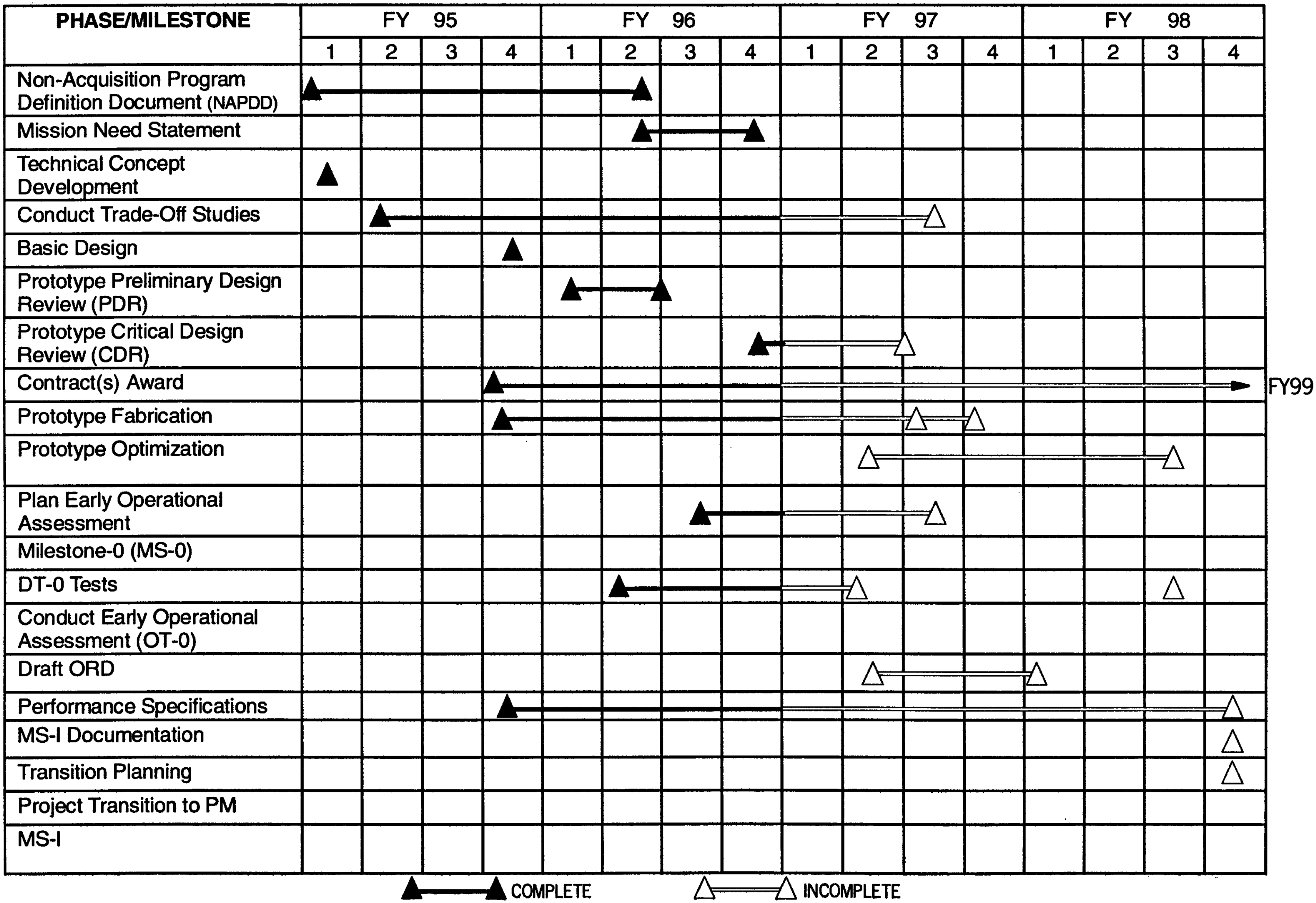
JOINT TACTICAL COMMUNICATIONS (JTC) ATD MILESTONES



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ATD 2. INTEGRATED COMBAT OPERATIONS CENTER (ICOC)

Problem/Deficiency/Opportunity

The C2 process can be described by the Observation-Orientation-Decision-Action (OODA) loop. Having observed a situation, one next orients on it and makes estimates, assumptions, analyses, and judgments to create a mental image of the situation. Then, one decides what to do and acts upon that decision. Having taken a decision and acted upon a situation, the situation then changes and, thus, the OODA process begins again with observation of the new situation. This illustrates a Commander's dilemma of dealing with the dual problems of uncertainty and time. In order for a Commander to be successful, he must be provided the information that allows his OODA loop to run faster than that of the enemy. With the information explosion that is occurring on the battlefield, it is imperative that only the necessary information be brought to a Commander's attention and in a format that permits him to take decisions based upon his experience base.

Technical Objective/Expected Payoff

The objectives of the ICOC ATD are:

a. To develop advanced concepts for a decision centered, knowledge based, Combat Operations Center (COC). These concepts will implement the guidance for C2 that is supplied in Fleet Marine Force Manual (FMFM) 15-3.

b. To develop a COC designed to deal with the two problems of uncertainty and time by performing requirements analysis and design for naturalistic decision making.

c. To develop an ergonomically designed configuration (systems, shelters, organization, and interactions) that is capable of operating anywhere and can be rapidly set up and struck.

The ICOC ATD also is supported by a companion 6.2 Human Factors program (initiated in FY95) that is sponsored by the Office of Naval Research (ONR).

Technical Background and Approach

The ICOC ATD is a six year program and there are three phases during those six years.

a. Phase 1 consists of laboratory demonstrations that will emphasize software development and proof of concepts. Phase 1 will be the primary focus of the program during FY96-97 and will continue on through FY98 through T&E of the installed concepts.

b. Phase 2 is the design and development of a fieldable COC. Phase 2 will be the primary focus of the program in FY98 but design activity will be performed in FY97.

c. Phase 3 will comprise field testing, upgrades recommended from the field testing, and transition activity. Phase 3 will be the primary focus of the program through FY99-01.

The laboratory demonstrations of the first phase will incorporate situation awareness software that is developed under the ATD as well as software that is leveraged off other DARPA and Marine Corps programs. That ATD software baseline will run on both the SunSPARC platform and the Hewlett Packard (HP) Reduced Instruction Set Computer (RISC) platform (i.e., Tactical Computer (TAC)). The ATDs will be carried out using SunSPARCs in FY96. In addition, the demonstration will incorporate a Silicon Graphics machine for displaying interactive 3-D software that is imported from other cooperative efforts. The decision for consolidation to a single platform (FY98 time frame) will depend upon the evolution of the Global Command and Control System (GCCS).

Summary of Prior and Current Year's Work

In FY95, the ONR human factors program at the Naval Research and Development (NRaD) facility funded a Cognitive Task Analysis (CTA). An effort was initiated with Klein Associates to study the current Marine Corps C2 process at the regiment level. The objectives of the Klein study are: an improved C2 process that should result in a shorter decision cycle; simplifying the procedures for executing C2 to reduce workload; and, re-engineering of the COC to eliminate unnecessary functions, consolidate the remaining functions, and to reduce the footprint of the COC.

The human factors program at the NRaD facility also funded the National Information Display Laboratory (NIDL) at Sarnoff to examine or forecast future technologies that might be incorporated into the COC. The output of both the Klein CTA and the NIDL technology forecast will be used to drive the development activity for the FY96 ATD.

Planned Work

Klein and NIDL Follow-On. In FY96, the results from the ONR sponsored CTA will be completed and the process of applying naturalistic decision making concepts for design of advanced human computer interfaces appropriate for the COC will begin. The ATD will take the results of the CTA and perform the following functions.

(1) The CTA will identify barriers that inhibit the operations with the regimental Ground Combat Element (GCE) COC and recommend solutions to those barriers. The ATD will implement a representation of the solutions on work stations running the MAGTF C4I software baseline or on a Silicon Graphics work station.

(2) The CTA will make recommendations for re-engineering the functions and operations within the GCE COC. The ATD will implement the re-engineering changes as part of the FY96 demonstration.

Under the ONR program, the NIDL will conduct a technology demonstration in February of FY96. The technology demonstration will focus imagery, large screen displays, and three-dimensional (3-D) software representation. The demonstrations will consist of poster board, hard copy, and work station representations. The ATD will take elements from what the NIDL recommends and will incorporate them into the prototype baseline to be developed in FY96. Further incorporation of technologies recommended by the NIDL may occur in FY97 as well.

Software Development and Integration. The ICOC ATD will focus on software modules that assist the Commander with situation awareness. The current MAGTF C4I software architecture will be used for those modules, where feasible. The software modules will consist primarily of new developments with some integration of existing capability from other S&T efforts into the ATD prototype baseline. New software developments include: the display of patterns or trends relating to force movements, traffic, or fire; intelligent agents for retrieving and filtering information requirements; animation for visually seeing patterns; improved Human Computer Interface (HCI) that includes voice recognition and possibly gesture input for some functions; representations of uncertainty; and, automatic prioritization of fire calls and linking them to Commander's Critical Information Requirements System (CCIRS).

Development from other programs that will be included into the prototype baseline, for the most part, run on Silicon Graphics work stations and provide 3-D visualization capability. There will be no attempt to port that capability to SunSPARC or TAC work stations running the COE because the current SunSPARC and TAC work stations will not adequately support the 3-D visualization capability. A Silicon Graphics work station will be part of the ATD prototype baseline. Components of software from the following programs are intended to be integrated into the ATD prototype capability:

CoVRT (ARL, Fort Huachuca, AZ). Establishes Commander's requirements for information that are important to him and that will be transmitted and portrayed on his work station. Also, trip wire or intelligent agent capability for changes in situation status that need to be brought to his attention (this is still in development).

Leathernet (NRad, San Diego,CA). Allows the Commander terrain visualization of the battlefield for planning and rehearsal.

ARL, Adelphi, MD. Provides Commanders 3-D visualization from any point on the battlefield and a fly through capability as well (the Army's Terrain Elevation Modules are components of this software). These modules are intended to be used for Digital Terrain Elevation Data (DTED) III-IV that will be available in the future and which can be demonstrated with three high resolution DTED data bases, at present.

Coordination With 6.2 Programs. The 6.2 programs sponsored by the AWT Directorate in the C4I area are an integral part of the ICOC ATD. The output of these programs will be part of the ATD's FY96 demonstration. The software and capability developed under these programs will be incorporated into the ATD's prototype baseline as they mature.

Transition Plan

The ICOC ATD software and computer hardware will be GCCS and MAGTF C4I compliant, wherever possible. In areas where the current implementation of GCCS and the MAGTF C4I software baseline do not technically support a capability such as real time 3-D visualization, near term exceptions are being allowed. Changes in hardware capability (e.g., TAC5) or evolution of the GCCS architecture itself may allow the present exceptions to be included under the GCCS architecture. With the intent of supplying GCCS compliant capability under this ATD, the computer hardware and software can transition to the Marine Corps Tactical Systems Support Activity (MCTSSA). In particular, the MCTSSA's current Interim Marine Expeditionary Force (MEF) COC effort is a transition goal. Products associated with the physical structure and packaging of the COC shall be added as new capabilities in the Marine Corps inventory.

Relationship to Other Programs

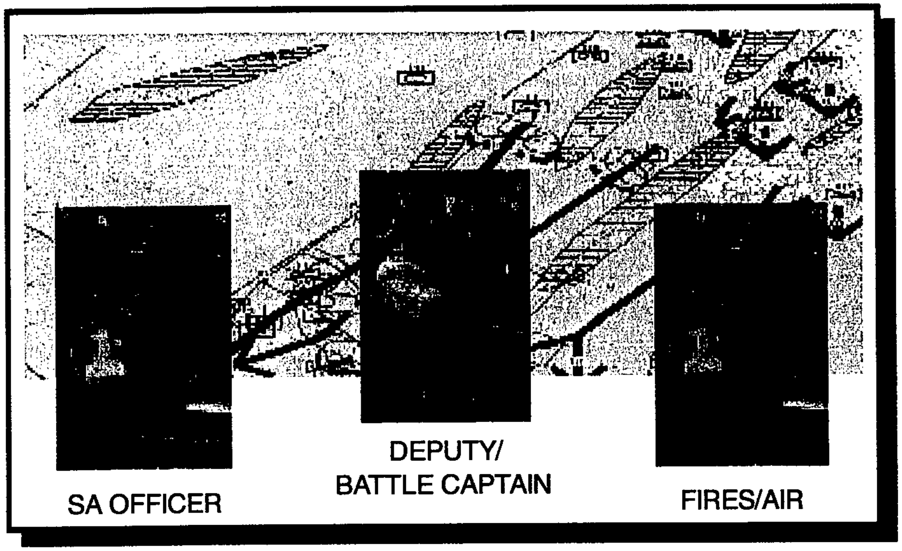
The ICOC ATD will coordinate activities and capabilities with the programs listed below.

Decision-Centered COC (ONR). This human factors R&D program directly supports the ICOC ATD. The ONR tasks will provide the basis for determining how uncertainty should be represented, for providing the ergonomic design for the COC, and for determining the HCI aspects of the COC.

Leathernet (DARPA ATD). The goals of this program partly overlap those of the ICOC program. For example, the goals of the DARPA ATD are to: integrate terrain, enemy and friendly force, obstacle, weather, and other information into an interactive 3-D presentation; visualize the battlefield in 3-D, evaluate and war game alternative courses of action, and then plan, rehearse, and monitor missions from a single work station; and, collect, process, disseminate, and present DTED Level III to Level V within time lines required to support force projection operations.

JTC (a Marine Corps ATD project). This ATD project is developing Low Probability Intercept (LPI) communication both for T1 (1.544 Mbps) LOS and LDR LOS. This ATD was initiated in FY95. The ICOC ATD will incorporate the communication capability from this effort starting in FY98 when the design of the fielded, mobile configuration begins.

INTEGRATED COMBAT OPERATIONS CENTER (ICOC)



OBJECTIVE:

- DEMO USMC COMBAT OPERATIONS CENTER TO SUPPORT COMMANDER RAPID, INTUITIVE DECISION MAKING, THROUGH:
  - ENHANCED SITUATIONAL AWARENESS
  - IMPROVED VISUALIZATION
  - COC ERGONOMIC EFFICIENCY
  - SHORTENED (OBSERVE-ORIENT-DECIDE-ACTION)

CAPABILITIES:

- NAPDD 95-2, INTEGRATED COC ATD, SIGNED 28 MAY 96
- REAL-TIME HIGH DATA RATE INTELL PROCESSING/ANALYSIS TAILORED TO USER (R-Q2)
- DECISION MAKING TRAINING (R-Q1)
- MERGED M&S AND C2 SYSTEMS (Y-Q1)
- BATTLEFIELD 3D VISUALIZATION SYSTEMS (Y-Q2)
- LAND/SEA PREVIEW/REHEARSAL, ALL LEVELS (Y-Q2)

APPROACH:

- UPFRONT TECH ASSESSMENT
- ESTABLISH REPRESENTATIVE STEERING GROUP (WDID, RATS, CWL, MSTD, DIR C4I, MCTSSA, ETC.)
- COGNITIVE TASK ANALYSIS ON DECISION MAKING - KLEIN & ASSOC
- INTELLIGENT AGENT INTEGRATION AND VISUALIZATION ENHANCEMENT THROUGH RAPID PROTOTYPING
- ENHANCED HUMAN COMPUTER INTERFACE, ANALYSIS AND DESIGN
- ERGONOMIC SCALEABLE COC DESIGN AND RAPID DISPLACEMENT PHYSICAL CONFIGURATION PROTOTYPE
- SCHEDULE CONCEPT DEMO AND EARLY USER EVAL JWID '97
- DOCUMENT AND TRANSITION TECHNOLOGY TO UNIT OPERATIONS CENTER (UOC) PROGRAM AND MAGTF C4I BASELINE
- SUPPORT CWL VISUALIZATION EFFORTS FOR HUNTER WARRIOR AWE. POTENTIAL DEMO AT URBAN WARRIOR

PERFORMERS:

- LABS: NRaD, MCTSSA, CECOM
- CONTRACTORS: BBN, SAIC, MITRE

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
KLEIN STUDIES (RGT, BN,)	▲		△	
NAPDD APPROVAL	▲			
ATD WORKING GROUP REVIEWS	▲ ▲	△ △	△ △	△ △
RGTL COC PROTOTYPE DEV	△	△		
HCI CMDRS DISPLAY DEMO		△		△
JWID 97 DEMO		△		
MERGE M&S			△	△

TRANSITION:

- DIR C4I (UOC/COCI PROGRAMS)
- MSTP IBSTF TEST SITE
- MCTSSA PM SOFTWARE

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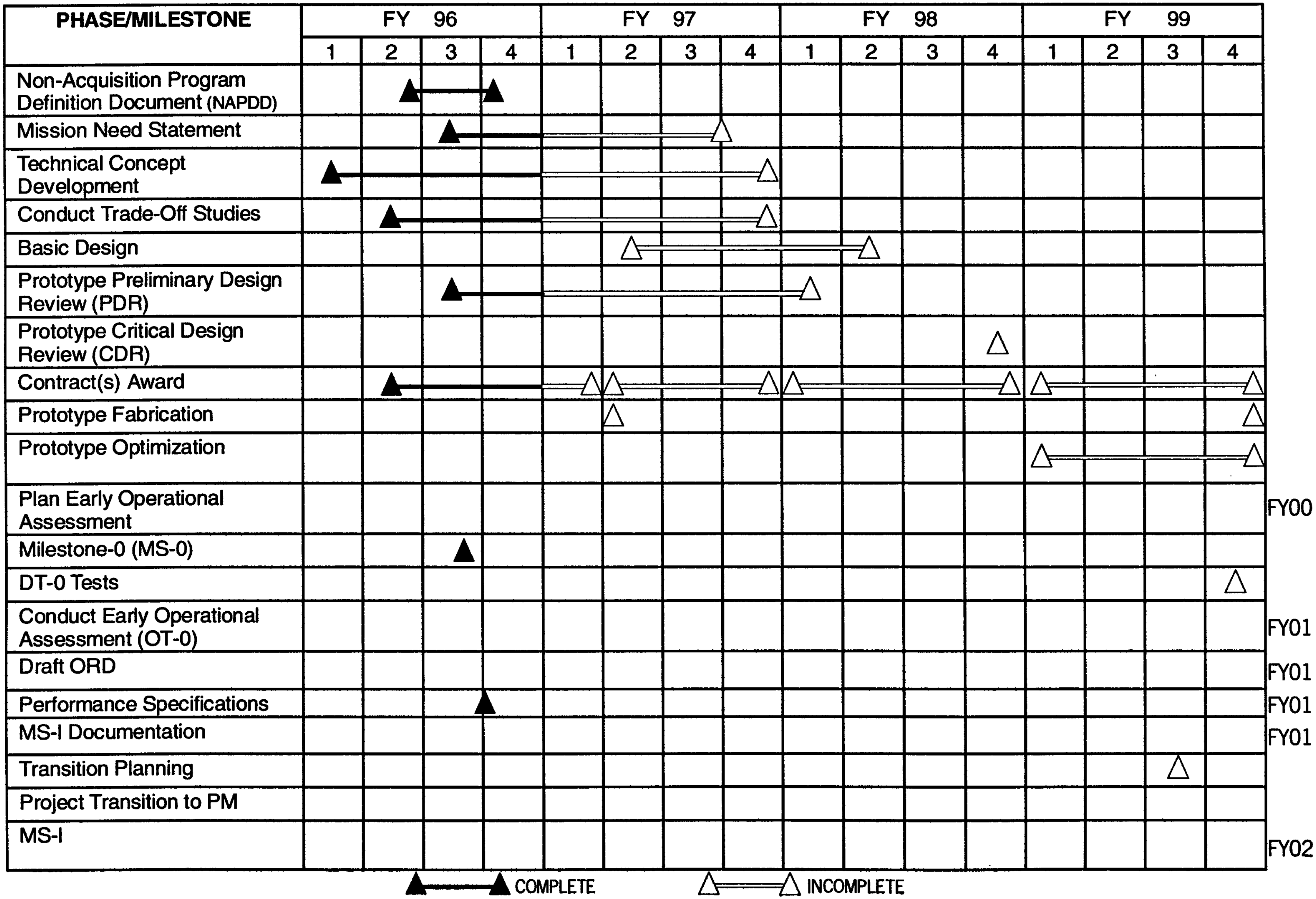
INTEGRATED COMBAT OPERATIONS CENTER (ICOC) ATD MILESTONES



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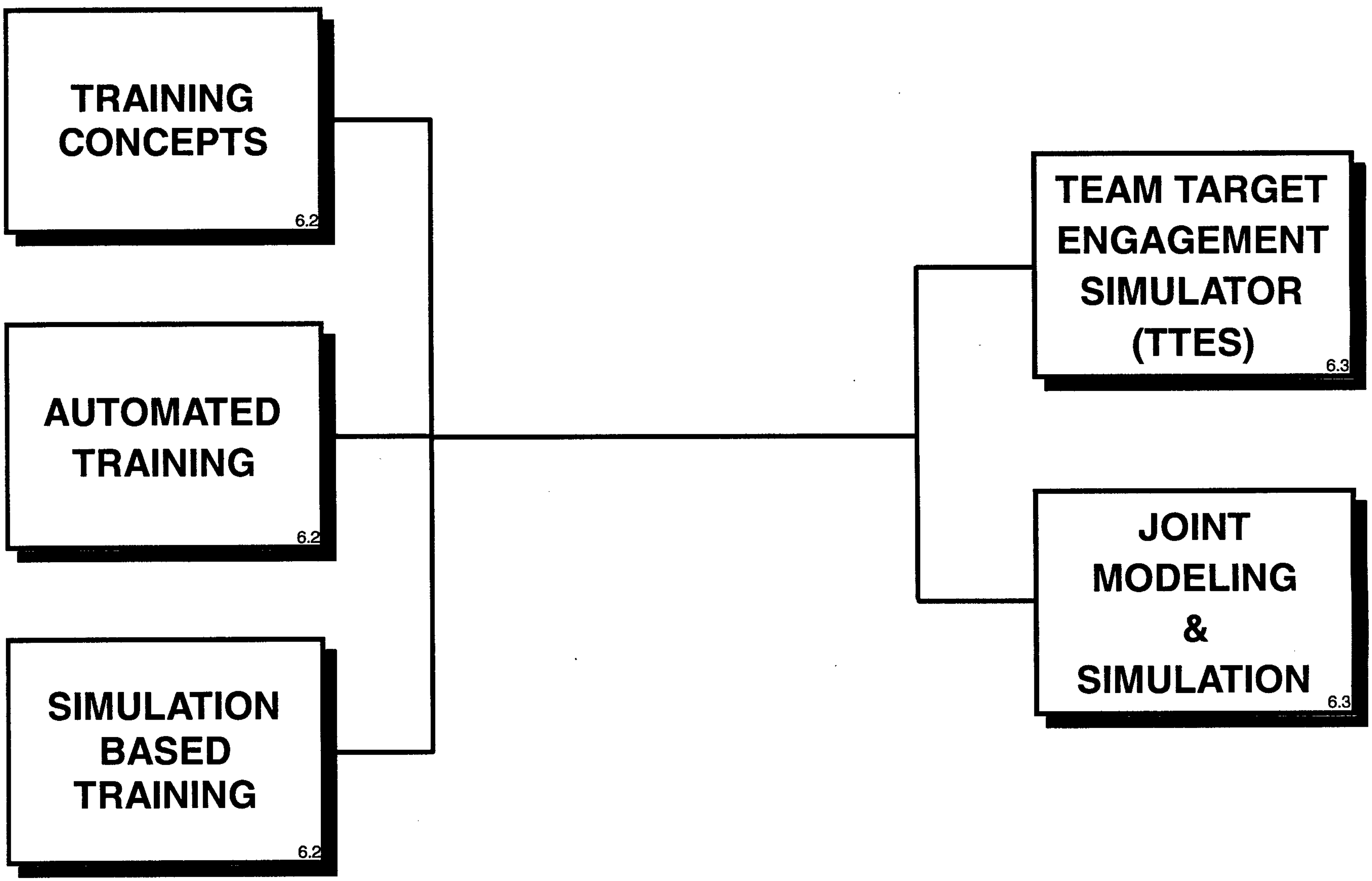
TRAINING AND EDUCATION IMPERATIVE



NOTE: SEE 6.2 PLAN FOR ALL 6.2 PROJECTS.

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Imperative Title: TRAINING AND EDUCATION

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ATD 1. TEAM TARGET ENGAGEMENT SIMULATOR (TTES)

Problem/Deficiency/Opportunity

The Marine Corps extensively trains personnel in preparation for its forward deployed missions. Many of these skills are perishable. Training of many warfighting skills aboard ship is not practical because of space limitations. During long deployments, many individual and unit (collective) skills tend to degrade which directly impacts combat readiness. There is a need to develop training technologies that will allow critical and perishable warfighting skills to be maintained. In the notional M&S effort, simulators for the individual combatant have been neglected.

Advanced M&S technologies now offer the opportunity to provide individual combatants a synthetic environment for force-on-force training and perishable skill maintenance. The TTES effort is focused on creating a simulated training environment for individual combatants. Initial concentration is on the urban environment due to mission value and degree of technical challenge. The use of advanced simulator technologies is intended to supplement and complement live range and field training.

Technical Objective/Expected Payoffs

The objective of the TTES effort is to demonstrate a core technology that allows individual combatants and small units to conduct force on force engagements in a synthetic urban environment. State-of-the-art technology will be addressed in Human Behavior Representation, Environmental Representation, and Trainee Interface. DIS protocols will be used for networking and communication tasks. Enhanced diagnostic tools will be enabled by application of virtual reality technology and superior modeling of trainee/weapon and target interaction. This effort will significantly reduce the cost and risk associated with further development and fielding of TTES trainers.

The training goal is to support attaining and maintaining critical and perishable combat skills in forward deployment and expeditionary situations. The opportunities provided by the TTES will significantly enhance combat readiness given the detrimental effects of extended deployments and the increasing constraints on training resources.

Technical Background and Approach

Current training of the individual combatant in a simulated environment consists of, essentially, digitizing two-dimensional pictures into a computer and presenting these pictures to the trainee. Because essentially all visual images must be pre-recorded, real time networking of

multiple trainers and modeling of neutrals and hostile combatants that allow the trainee to see what hostiles, neutrals, and other trainees are doing is not practical. Furthermore, because the environment is represented as a series of two dimensional pictures, modeling of the effects of weapons, as well as the traversing of terrain and buildings by the trainee, is limited.

The approach of the TTES effort is to create a computer model of the urban environment to support visual displays, employment of weapons, traverse of terrain, and movement within buildings by entities (both trainees and computer controlled). Real time computer generated graphics are used for all visual images presented to the trainee, e.g., human figures, terrain, and buildings. DIS is used to network multiple trainers and computer controlled hostile combatants. This approach has only recently been made possible by advances in simulation, modeling, and computer generated graphics.

Summary of Prior and Current Year's Work

An evaluation suite for the TTES trainer was developed at NAWCTSD. It involves an advanced graphics generator, a rear screen projection and display system, a foot pad for trainee interface, and an instrumented M-16A1. Quantico Combat Training Village was modeled using MultiGen and is rendered with a Silicon Graphics Incorporated Reality Engine 2. Trainees and Computer Controlled Hostiles/Neutrals (CCH/N) animated human figures were developed by Boston Dynamics Incorporated. Two trainees and a PC controlling up to 30 CCH/N are currently networked using the DIS protocols. The evaluation suite has the following characteristics.

Traversing Urban Environment. The trainee can traverse the synthetic urban environment including movement across terrain and within buildings.

Weapon. The trainee can fire an M16A1 at other entities in the environment. When the trainee pulls the trigger, a boresight vector is generated and a ballistics profile is used to fly the round through the environment to a point of impact.

Computer Controlled Hostiles (CCH). Multiple CCH are modeled and graphically depicted to trainees. The CCH detects the trainee when a clear LOS exists and the CCH is oriented toward the trainer. Upon detection of the trainee, the CCH will fire or seek cover. The trainee can fire at and hit the CCH.

Multiple Trainees Can Simultaneously Train. DIS is used to network multiple trainee stations, the CCH/N station, and the operator/instructor station.

Growth Potential. The evaluation suite was developed in a modular fashion to permit the incorporation of new components (e.g., weapon interfaces, visual displays, geographical sites, and types of CCH/N). Silicon Graphics Incorporated was selected because of the need for real time graphic generation of human figures and urban terrain, the availability of a range of computer models, and the expected continued evolution of this line of computers.

Planned Work

The following efforts are planned for FY96.

a. Redesign and implement an interface for controlling movement and direction of gaze.

b. Integrate a new tracking position to determine firing accuracy.

c. Develop an operator station for creating, conducting, and debriefing training exercises.

d. Conduct a field evaluation with four trainee stations.

Transition Plan

The DEM/VAL phase will be under the management of the PM for Training Systems, MARCORSYSCOM for continued development. Fielding of a rugged, deployable advanced trainer based on TTES technology is projected for the 2002-06 time frame. Wide proliferation throughout the operational forces and the training establishment of the Marine Corps is expected. The Army TRADOC has expressed interest and the Army Infantry School is monitoring the current effort. Appeal exists for an earlier, less deployable version to the Special Operations and Law Enforcement Communities.

Relationship to Other Programs

Programs that contribute to, and benefit from, the TTES effort include the Hands-On-Throttle-And-Stick (HOTAS) (6.3) effort to develop a deployable mission rehearsal system for the F/A-18, Head Mounted Visual Display (6.3), and the Virtual Environment Training Technology (6.2) effort which is developing and evaluating virtual environment component technologies for training applications. The Army Simulation, Training, and Instrumentation Command (STRICOM) (colocated with the NAWCTSD) is heavily involved with development of DIS and computer controlled combatants. The TTES project is an integral part of the Joint Individual Combatant M&S effort.

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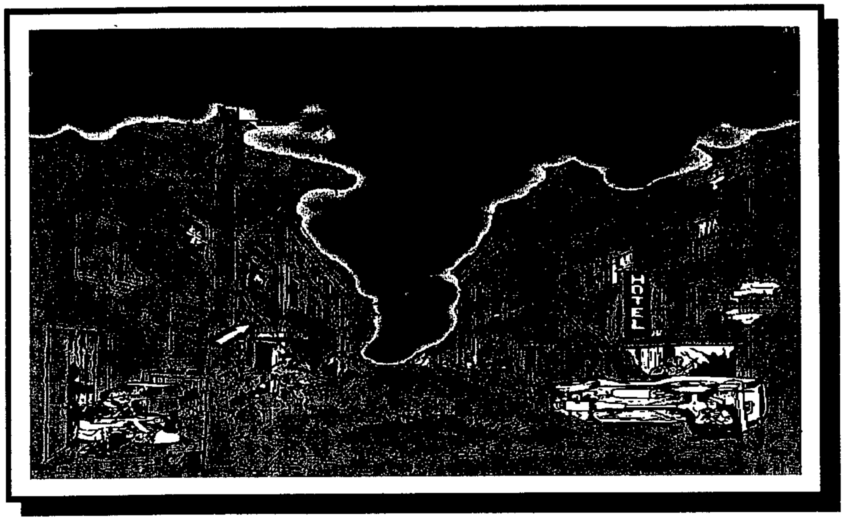
TEAM TARGET ENGAGEMENT SIMULATOR (TTES)



OBJECTIVE:

- PROVIDE A REALISTIC, DEPLOYABLE AND AFFORDABLE SYSTEM FOR INDIVIDUAL AND SMALL UNIT COMBAT TRAINING, MISSION REHEARSAL AND OPERATIONAL ASSESSMENT

CAPABILITIES:

- INTEROPERABLE DISTRIBUTED, IMBEDDED (Y-Q1) TRAINING SYSTEMS
- INCREASED REALISM (RT-Q1-Y)
- ADVANCED TRAINING FACILITIES (CWL)
- SYSTEMS FOR SELF TRAINING (CWL)
- TTES MNS
- INFANTRY SQUAD TRAINING SIMULATOR MNS

APPROACH:

- VIRTUAL REALITY
- DETERMINE SPECIFIC TEAM/INDIVIDUAL PERFORMANCE OBJECTIVES
- SCENARIO/WEAPON MODELING
- MICRO-ENVIRONMENTAL AND BEHAVIORAL REPRESENTATION
- INTEGRATE WITH USMC "FAMILY OF SIMULATORS"
- INTEGRATE WITH SAME AND HIGHER LEVEL CONSTRUCTIVE SIMULATORS
- DESIGN FOR FUTURE TECH INSERTIONS
- SUPPORT LOE/AWE URBAN WARRIOR AND CAPABLE WARRIOR
- PARTICIPATE IN MOUT AND SEA DRAGON ACTDs

PERFORMERS:

- NAWC-TSD, ORLANDO, FL, U.S. ARMY STRICOM, CONTRACTORS: SwRI, IST

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
PROTOTYPE DEV				
FIELD EVAL & DEMO				
M/S I				
DEM/VAL EMD				
AWE/LOE/ACTD				
6.2/6.3 TECH INSERT				

TRANSITION:

- PM - SST - MAGTF INDIVIDUAL COMBAT SIMULATION SYSTEM (MICSS)
- U.S. ARMY STRICOM

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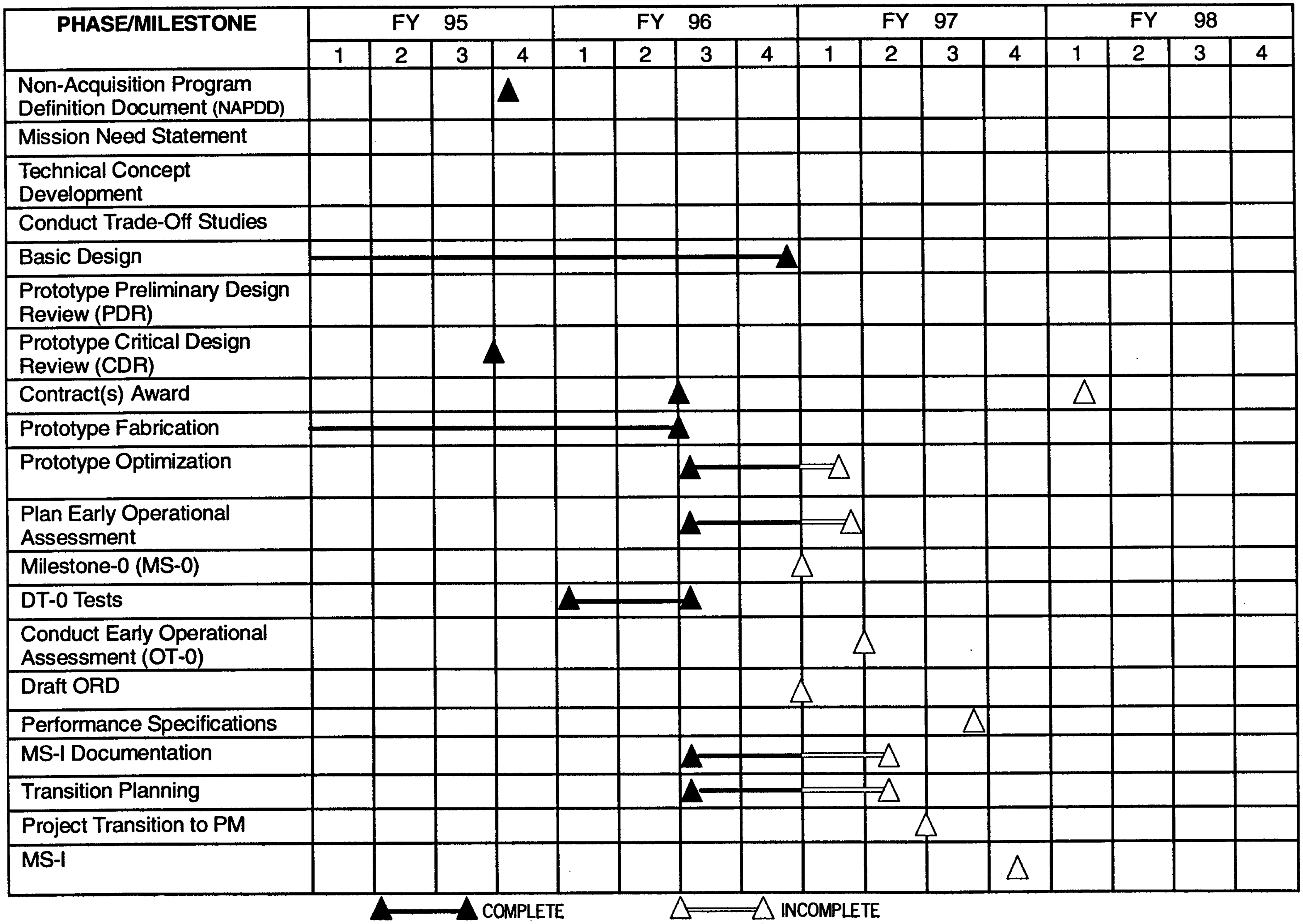
TEAM TARGET ENGAGEMENT SIMULATOR (TTES) ATD MILESTONES



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ATD 2. JOINT MODELING AND SIMULATION (JOINT M&S)

Problem/Deficiency/Opportunity

The future of the Marine Corps, as manifested in the OMFTS concept, is contingent upon a capability to conduct joint and combined forces operations, training, and support. Operational tempo will be increased, while planning, training, and preparation time will be decreased. Limited resources will restrict training at all levels, though capability to coordinate and interoperate at all levels will be even more important. In this high demand, low resource environment, new concepts for training, operating, and supporting the force are necessary.

M&S provides the capability to maintain readiness and operational capability at a level not possible using conventional means. The full realm of M&S can be employed to benefit operational capability, from training, to concepts evaluation, to operational assessment, to mission rehearsal, and after action analysis.

In the training environment, individual Marines can train in a virtual environment with their Table of Organization (T/O) weapons or link the live and the virtual. Units can operate with or against other units at geographically separated sites. Command elements can train alone or with units using the same decision aids and tools used in live operations.

In the research, development, and acquisition environment, the Marine Corps can test equipment in an operational environment as part of the design process. In combat development, operational concepts may be tested with out field units.

M&S has a potential to have a larger impact upon the overall operational capability of the Marine Corps than any individual weapon system or operational concept. The benefits may be gleaned in the near term through the foreseeable future.

Technical Objective/Expected Payoff

The primary and long range objective is to integrate Marine Corps M&S technology with that of the DOD community as a whole. This will allow seamless training, support, analysis, systems development and operations within the joint environment.

Provide technology for M&S based training with all Marine Corps weapons systems. This will drastically reduce training costs and increase proficiency/capability.

Provide technology to integrate M&S and command, control and communication (C3) capabilities. This provides a seamless training/operational systems with the capability to "train as we fight."

Provide for development of specific Marine Corps "entities" to play in Marine Corps and joint simulations. This allows reliable analysis of Marine Corps systems in all M&S environments.

Provide technology for simulation based small unit operational trainers. These trainers will allow intensive training while deployed, as well as increase proficiency and capability.

Provide technology to make simulation based training systems deployable. This will allow all simulation based systems to provide maximum benefit.

Provide technology for rapid generation of synthetic data bases. This provides an operational capability to do mission analysis and rehearsal.

Technical Background and Approach

The state of the art in M&S Technology is changing daily. A large number of Marine corps M&S needs are met by existing or ongoing capabilities within the DOD and civilian communities. The technical approach is to leverage, as heavily as possible, to fulfill Marine Corps needs and objectives and to develop technologies to fill "gaps" in the available technology as well as integrate unique Marine Corps M&S needs.

Summary of Prior and Current Year's Work

This project was a new start in FY96. The primary focus was development of a range instrumentation system for individuals and vehicles to allow operational concepts analysis and instrumentation technical concepts experimentation. In addition, a M&S technology investment strategy for the near/mid-term was developed. Specific accomplishments were: development and installation of a range instrumentation system; integration of the range instrumentation system with the DARPA sponsored Leathernet Individual Combatant Constructive Simulator; development of an analysis and after action reporting capability for the range instrumentation; and, development of a Marine Corps M&S Technology Investment plan.

Planned Work

The planned work for designated years is as follows.

FY97.

(1) Continue with development of the experimental range instrumentation system. Conduct a range instrumentation study to identify and evaluate technical options for the spectrum of Marine Corps range instrumentation needs.

(2) Begin developing technologies for rapid generation of synthetic data bases.

(3) Begin developing Marine Corps unique entities and environments to support the spectrum of simulation based systems.

FY98 and beyond.

(1) Complete the range instrumentation effort and transition.

(2) Continue development of rapid synthetic data base generation technology. Transition as available.

(3) Continue developing Marine Corps unique entities and environments. Transition as available.

(4) Begin integration of M&S and C3 concepts.

Transition Plan

These efforts will transition to multiple projects. Certain efforts will provide a unique capability, while others will improve existing capabilities as well as allow full Marine Corps use. Specific transition plans are contained in the previous paragraph.

Relationship to Other Programs

This technology project leverages developments within the following programs.

a. Battlefield Distributed Simulation Demonstration (BDSD).

b. Battle Lab Reconfigurable Simulator Initiative (BLRSI).

c. Combined Arms Tactical Trainer (CATT).

d. Common Operational Modeling Planning and Simulation System (COMPASS).

e. Naval Simulation System (NSS).

f. Close Combat Tactical Trainer (CCTT).

g. Warrior Network.

This technology project provides developments for the following programs.

a. FO/FAC.

b. Joint Simulation System (JSIMS).

c. Joint Warfare Analysis System (JWARS).

d. Joint Material Analysis Simulation System (JMASS).

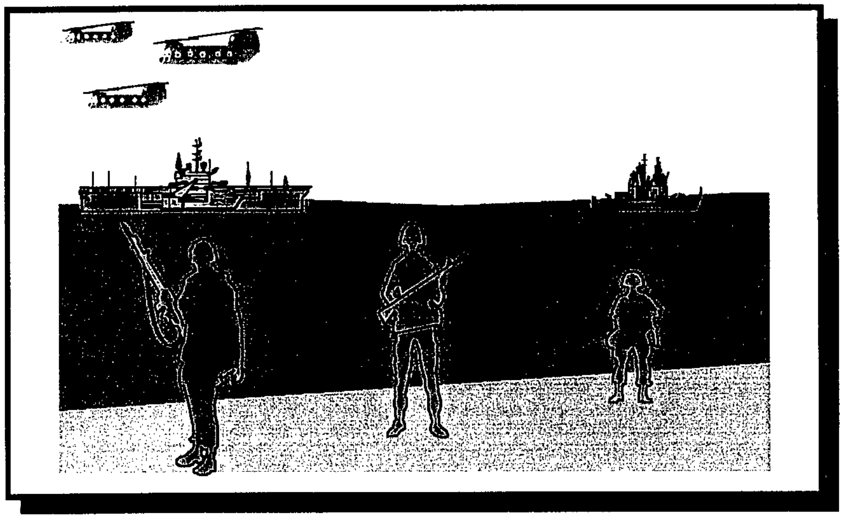
e. Joint Tactical Combat Training System.

f. Closed Loop Artillery Simulation System (CLASS).

g. Range Instrumentation System (RIS).

h. TTES.

JOINT MODELING AND SIMULATION



APPROACH:

- DEVELOP UNIQUE OBJECTS/ENTITIES FOR SYNTHETIC LITTORAL BATTLESPACE
- LINKAGES/FIT TO OTHER USMC AND JOINT MODELS
- MINIATURIZE, NETWORK TRAINERS, CAPITALIZE ON IR&D
- RANGE INSTRUMENTATION SYSTEMS
- MAGTF INDIVIDUAL COMBAT SIMULATION SYSTEM (MICSS)
- SUPPORT AWE/LOE HUNTER WARRIOR, URBAN WARRIOR, CAPABLE WARRIOR
- PARTICIPATE IN MOUT AND SEA DRAGON ACTD

PERFORMERS:

- NAWC-TSD & STRICOM, ORLANDO, FL
- MITRE, SWRI

OBJECTIVE:

- ENHANCED MAGTF CAPABILITY THROUGH SIGNIFICANT TRAINING IMPROVEMENTS IN NUMEROUS AREAS AND LEVELS, SPECIFICALLY TRAINING TAILORED TO NEW OPERATIONAL CONCEPTS AND TECHNOLOGIES

CAPABILITIES:

- DECISION MAKING TRAINING (R-Q1)
- INTEROPERABLE DISTRIBUTED, IMBEDDED TRAINING (Y-Q1)
- INCREASED REALISM (Y-Q1)
- MODELING AND SIMULATION SUPPORT (R-Q1)
- ADVANCED TRAINING FACILITIES (CWL)
- SYSTEMS FOR SELF TRAINING (CWL)
- MODELING AND SIMULATION CENTERS MNS
- MODELING ANS SIMULATION TOOLS FOR OPS MNS
- CLOSED-LOOP ARTILERY SIM MNS
- COMBAT VEHICLE APPENDED TRAINER MNS

SCHEDULE:

TASKS	FY96	FY97	FY98	FY99
PROTOTYPE DEV		△ — △		
FIELD EVAL & DEMO	▲ — ▲	△ —	△	
M/S I		△	△	△
DEM/VAL EMD		△ —	—	— △
AWE/LOE/ACTD		△	△	△ △
6.2/6.3 TECH INSERT		△ —	—	— △

TRANSITION:

- PM - SST - RIS, TTES, MICSS
- PM - C4I - ICOC
- PM - CBG - CVAT, CLASS, TLDHS TRAINER
- U.S. ARMY STRICOM

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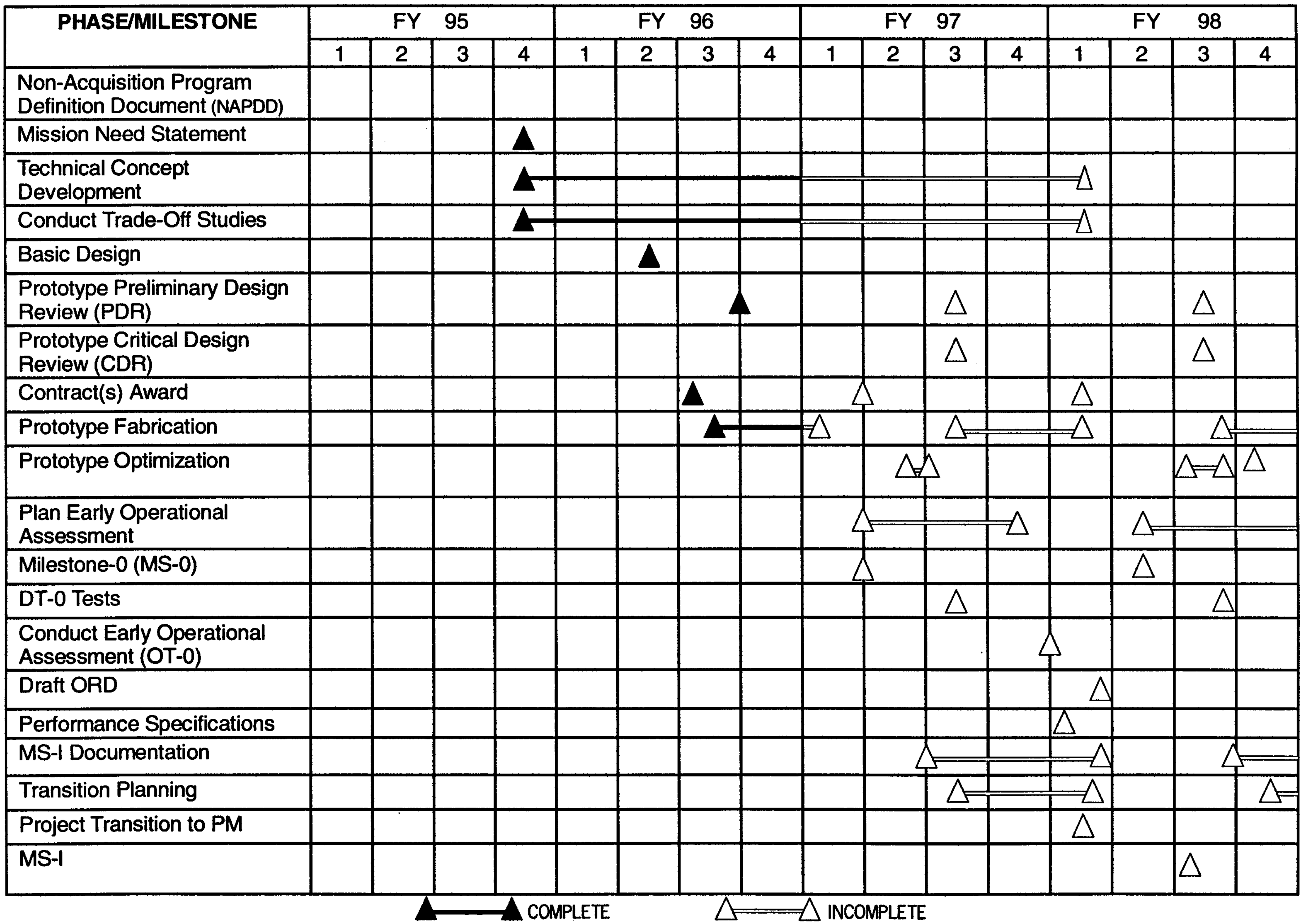
JOINT MODELING AND SIMULATION (JOINT M&S) ATD MILESTONES



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ANNEX A

THE COMBAT DEVELOPMENT PROCESS

The Marine Corps Combat Development Command (MCCDC) owns the Combat Development Process (CDP). It is from the CDP that both formal and informal requirements flow. Even though Applied Research (6.2) efforts are legitimate even in the absence of formal documentation such as Mission Needs Statements (MNS) and Operational Requirements Documents (ORD), the CDP is looked to for needs and requirements upon which to base 6.2 investment decisions. The Science and Technology (S&T) Roundtable has fortuitously been a mechanism of convenience that also seems to bring together the MCCDC proponents and the Marine Corps Systems Command (MARCORSYSCOM) operatives in a collegial environment to work the very complex challenge of identifying, agreeing to, and prioritizing capability deficiencies to which technology might be applied.

The CDP is composed of three components as follows:

The Concept Based Requirements System (CBRS) which:
- Develops the concepts
- Assesses the capabilities
- Determines the requirements

The Solution Development System (SDS) which:
- Meets the requirement through one or more of five solutions:
  - Doctrine
  - Organization
  - Equipment
  - Training & Education
  - Support/Facilities

The Capability Support System (CSS) which:
- Updates
- Maintains
- Reviews

CONCEPT BASED REQUIREMENTS SYSTEM

The Marine Corps Master Plan (MCMP) process is a biennial effort that provides direction to program developers to optimize resource allocation. The CBRS development process identifies and develops linkages between strategies, operational concepts, and warfighting capability requirements.

Our operational concepts are a direct representation of the Corps' long range "vision". This concept-based process optimizes the capability and versatility of the Marine Corps of the future rather than merely correcting the deficiencies of the past. It forces us to look beyond tomorrow. As such, these concepts are the starting point in the CBRS -- the "front end" of the Marine Corps Enterprise. Figure A-1 portrays how we use the CBRS to transform our concepts into Combat Ready forces.

The Marine Corps Business Enterprise mission is to identify, develop, and field integrated capabilities, based on fundamental concepts, access doctrine, organizations, training and education, equipment, facilities and support, and information to meet the needs and requirements of our customer, the operating forces. Concepts provide a framework for identification and development of future required operational and functional capabilities. These capabilities focus the development efforts for determination of the force structure requirements needed by governmental planning, programming, and oversight agencies.

The CBRS takes higher level guidance and generates the prioritized implementing actions that shape the future Marine Corps. Operational and functional concepts initiate the sequence, providing background, direction, and a listing of broad required capabilities. MAA and Capability Assessments are process activities that are linked to the focus of effort provided in the MCMP. Other source documents include: Fleet Operational Need Statements (FONS), Marine Corps Lessons Learned System (MCLLS), CINC Integrated Priority Lists (IPLs), Joint Mission Area and Support Area (JMA/SA) assessments, and Joint Warfighting Capability Area (JWCA) assessments.

The MAA process analyzes these capabilities and assessments using the detailed functions from the Universal Joint Task List and the Marine Corps operational framework. MAAs identify deficiencies in doctrine, organization, equipment, training and education, and facilities and support. FONS and the MCLLS provide invaluable input and feedback to this process. The MCMP provides the vehicle through which the broad operational capabilities identified in the major concepts are prioritized by the senior leadership. This list becomes the basis for the remainder of the process and provides input to the resource allocation process.

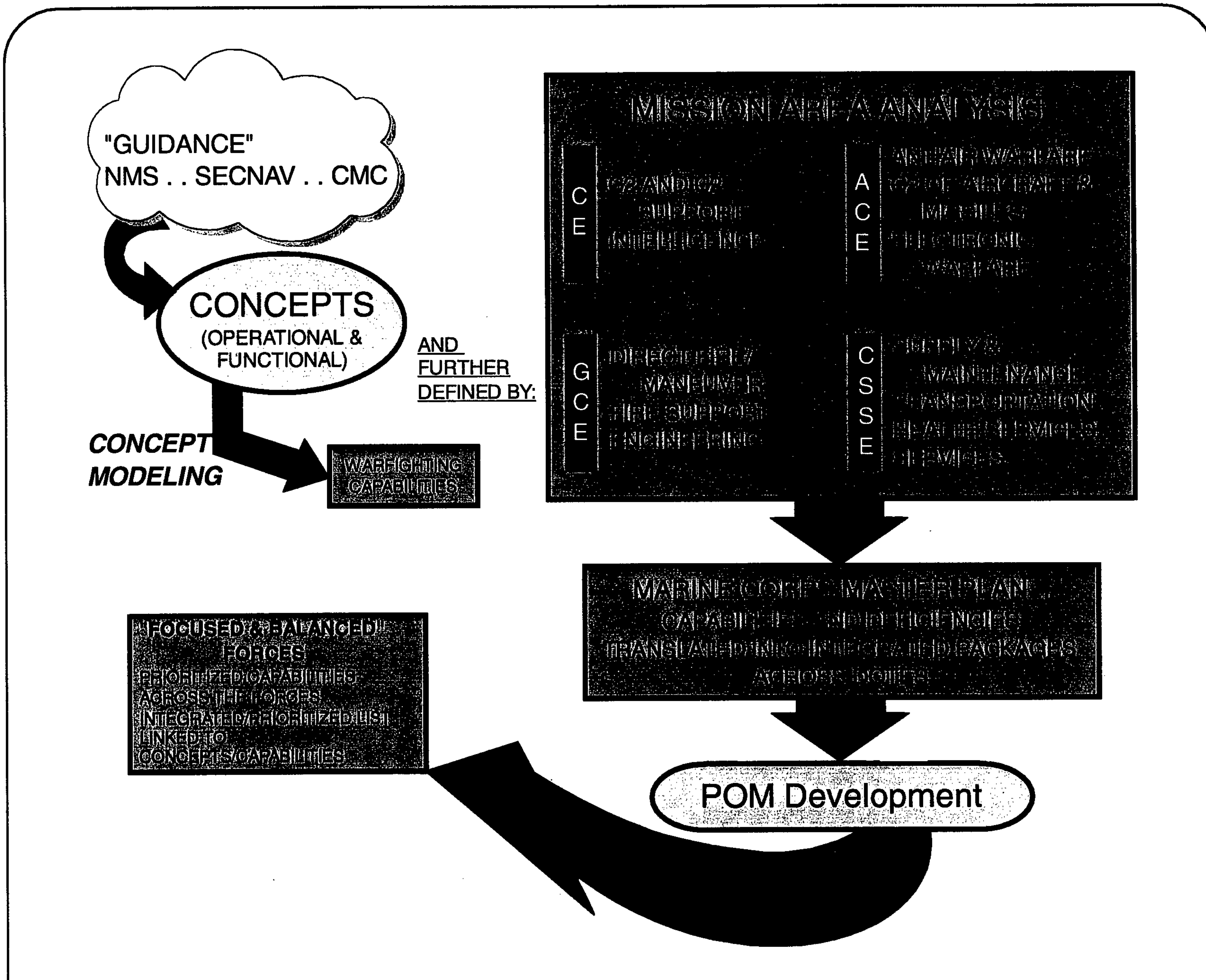

FIGURE A-1. TRANSFORMATION OF CONCEPTS INTO REQUIREMENTS

ACRONYMS
FOR
FIGURE A-1. TRANSFORMATION OF CONCEPTS INTO REQUIREMENTS

ACE	AVIATION COMBAT ELEMENT
C2	COMMAND AND CONTROL
CE	COMMAND ELEMENT
CMC	COMMANDANT OF THE MARINE CORPS
CSSE	COMBAT SERVICE SUPPORT ELEMENT
DOTES	DOCTRINE, ORGANIZATION, TRAINING AND EDUCATION, EQUIPMENT, AND SUPPORT/FACILITIES
GCE	GROUND COMBAT ELEMENT
NMS	NATIONAL MILITARY STRATEGY
POM	PROGRAM OBJECTIVE MEMORANDUM
SECNAV	SECRETARY OF THE NAVY

ANNEX B

THE SCIENCE & TECHNOLOGY ROUNDTABLE PROCESS

The Roundtable process for the Department of the Navy and the Marine Corps is a work in progress. The Navy initially chartered a total of 16 Roundtables. Of these, six were of primary interest to the Marine Corps and the Corps participated in them as follows:

Forward Presence
Surface Battlespace
Command, Control, Communications, Computers, and Intelligence (C4I)
Mine Warfare
Surveillance
Combat Service Support (CSS)

At the conclusion of Roundtable I for these six, it was mutually agreed by Marine Corps Systems Command (MARCORSYSCOM), Marine Corps Combat Development Command (MCCDC), Office of Naval Research (ONR), and Office of the Chief of Naval Operations (OPNAV) that it would be appropriate to charter and conduct a roundtable to address Marine Corps-unique warfighting functions that did not receive the appropriate level of emphasis in the aforementioned Roundtables. The Marine Corps Roundtable was titled Expeditionary Warfare Roundtable. Participants included representatives from the following organizations:

All Program Managers (PMs) from MARCORSYSCOM
All Divisions of MCCDC
Marine Forces Atlantic
Marine Forces Pacific
Headquarters, Marine Corps (P&R, PP&O, LP, C4I)
OPNAV (N81, N85, N91)
ONR (Code 32, OOMC)
Program Executive Office, Mine Warfare

The Science and Technology (S&T) Roundtable is a two stage process designed by OPNAV (OP-91). Stage I is Roundtable I. It's basic output is a prioritized listing of capabilities and functions arranged into "quartiles" wherein the items in the top quartile (or quarter) are deemed more important than those in the lower or fourth quartile. Figures B-1 through B-5 depict this prioritization of capabilities and functions by Warfighting Imperative. Stage II of the roundtable process is Roundtable II, whose product is a determination by the Office of Naval Research (ONR) of the level of effort that the technology community at large is applying against the capabilities and functions in the quartiles. Basically, this is a matrix which matches

technology efforts against items in the quartiles. When the Marine Corps Expeditionary Warfare Roundtable II results were analyzed, it appeared that there was a lot of technology effort being applied against the items in the quartiles. To determine the effectiveness and applicability of these apparent efforts, a detailed assessment was made by the Amphibious Warfare Technology (AWT) Directorate. The objective of this assessment was to determine whether or not adequate investment was being made toward the solution of deficiencies implied by the items in the Roundtable quartiles.

The Expeditionary Warfare S&T Roundtable assessment process is depicted in Figure B-6 and is described in four steps as follows:

STEP 1

A list of 330 S&T programs were reviewed and placed into one of two groups. Group "A" contained only those programs that the subject matter expert felt could be evaluated against the following criteria:

a. Military capability (Operational Maneuver From the Sea (OMFTS), Mission Needs Statement (MNS), Operational Requirements Document (ORD), Roundtable-1 (RT-1), Non-Acquisition Category (ACAT) Program Definition (NAPDD), Technology Demonstration (TD), and operational utility)

b. Uniqueness (Amphibious operations, expeditionary, littoral)

c. Transition potential (funding sources, milestones scheduled, PM assigned/supporting, jointness)

d. Enabling S&T (support feasibility demonstration, risk reduction, support emerging concepts)

Group "B" contained the remainder of the S&T programs and all 6.1 programs.

STEP 2

The Group "A" list was reviewed and revised to align with appropriate Warfighting Imperatives and to prevent duplication. Then, any "B" list programs that appeared to directly support USMC OMFTS needs were transferred to the "A" list. Next, for Group "A" programs, coordination was conducted with the appropriate Navy, Air Force, National Laboratory, Department of Energy (DOE), Defense Advanced Research Projects Agency (DARPA), or Army point of contact to obtain sufficient program information, and with appropriate PMs for transition information. A scoring sheet was used to assess programs against criteria listed in Step 1.

WARFIGHTING THRUST AREA: Maneuver (Sea base to Objective Maneuver/Mobility)

SUPPORTING REQUIREMENTS:

I

Full recon/neutralization in surf/beach zone
Instride obstacle breaching while under fire
Breaching assets as mobile as force
Neutralization of advanced/hardened mines
Modular weapon/combat support transport
All terrain/weather/environment
Signature reduction
Defensive weapons capability [To FP]
Vehicle structures survivable to blast/kinetic penetration
Non-obtrusive ID (Prevent friendly fire, all echelons) [To C2]

II

Instride gap crossing
Nonmetallic mine detection
High area rate standoff recon
Increased speed/range
Increased platform efficiency
Ability for night/weather/smoke/dust/artificial obscurants [To FP]
Improved lightweight body armor
Security: Improved detection/surveillance [To FP]

III

Off route smart mine clearance
Increased maneuverability
Logistics integration
Optimum speed
Optimum team/squad size
Extend visibility range to match weapon range
Intelligent, autonomous wide area denial system
Lightweight/low heat stress personal CB protection
Immunity to NBC attack

IV

Multilevel security on the battlefield
Rapid obstacle barrier construction
Rapid obstacle barrier construction
Lightweight gamma detector
Remote, instantaneous biological sensor
Standoff chemical detection (10km)
Vehicle collective CB protection (20 persons)
High efficiency, integrated, environment-controlled CB protection
Environmentally harmless CB decontamination
Individual protection against nuclear contam
Hardening electronics against nuclear blast generated EMP
Integrated NBC protection

FIGURE B-1. EXPEDITIONARY WARFARE S&T ROUNDTABLE I - MANEUVER

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WARFIGHTING THRUST AREA: Firepower

SUPPORTING REQUIREMENTS:

I

Precision location at substantial range from sensors
ID (incl ground/CAS IFF, coop/non-coop AAW IFF)
Integration of all fire
Multiple sensor target processing
Increase range (all weapons)
All environment, quick resp close-air/close-in support
Defensive weapons capability [From Maneuver]
Multi-spectrum C2 detection/location [To C2]
Improved multi-spectrum EA [To C2]
Intrusion in enemy's C2 network [To C2]

III

Close combat target display/Battle damage assessment
Integration of AAW surv sys with other services' systems
Tactical missile/defense surveillance systems
Adv propulsion/penetration tech (incl adv KE)
Indiv weapons: 0 (10) lighter, incr reliability
AAW weapons control and support systems
Affordability (all weapons)/Easily maintainable
Reduced footprint ashore/Non RF EA (not jamming)
Detect intrusion on C2 networks
Improved electronic CCM (LPI/covert/jam resistant)
Integration with other services/coalition products/Improved LPI detection/location
Wide-area nonchem incapacatants (15 min)/Man-portable, reinforced target/wall breaching mechanism

II

Real-time target/image processing
VLO air target detection/tracking
Cooperative engagement
Improve queuing of man-portable AAW weapon sys (Sensors only)
Ability to put 1st round on target (meter precision)
Fusion of close combat battlefield sensors
Directed energy weapons (reduce munitions reqs)
Increase shooter mobility
Improved multi-echelon EA compatibility [To C2]
Crowd control device (1,000) people
Nonlethal short-range single encounter weapon
Ability for night/weather/smoke/dust/artificial obscurants
Security: Improved detection/surveillance
Reduction of consumables (Ammo only)

IV

Electro-optics
Man-portable weapon to defeat main battletank
Counter-countermeasures for anti-armor
Area denial weapons
Insensitivity (all weapons)
Increased shelf life (30 yrs)
Helo-transportable (incl prime mover)
Reduced resources to deliver
Improved reporting

FIGURE B-2. EXPEDITIONARY WARFARE S&T ROUNDTABLE I - FIREPOWER

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WARFIGHTING THRUST AREA: Combat Service Support (Sea-based/Reduced Footprint)

SUPPORTING REQUIREMENTS:

I

Reduced footprint ashore (tailored presence ashore)/
maintain control of ops
Modeling and Simulation Support
Amphibious lift (design for sea-basing, VX and SBX)
[Supply]
[Maintenance]
[Transportation
[Deliberate engineering]
[Health]
[Services]

II

Optimized mobile electronic power [deleted]
Reduced logistical requirements [deleted]
Aviation supported [deleted]
Reduction of consumables (less ammo)
Embedded self-diagnostics
Disposable technology (replace over repair)
Test and evaluation: virtual prototyping [To T&E]

III

High speed mobility
Adv materials for roads/buildings
Adv expeditionary field fortification
Casualty treatment
Miniaturization
Corrective maintenance (self-correction)
Non-intrusive structural inspection

IV

Casualty evacuation
Temporary hospitalization
Casualty collection
Increased delivery efficiency
Environment independent
Rapid onload/offload
Improved material handling
Insensitive munitions
Nontoxic packaging
Lightweight/stronger/modular packaging
Environmentally friendly materials
Self-testing/calibration
Health maintenance

FIGURE B-3. EXPEDITIONARY WARFARE S&T ROUNDTABLE I - COMBAT SERVICE SUPPORT

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WARFIGHTING THRUST AREA: Command and Control

SUPPORTING REQUIREMENTS:

I

Comms: Secure, covert, high speed (incl imagery), worldwide
MAGTF integrated to all echelons
Merged M&S and C2 systems
Decision support system: (Distributed/networked for combat ops)
Shared appropriate situational awareness
Fused intel info at higher levels
Non-obtrusive ID (prevent friendly fire (all echelons) [From Maneuver]
The individual Marine/combat vehicle tracking instrumentation
Mult-spectrum C2 detection/location [From FP]
Improved multi-spectrum EA [From FP]
Intrusion in enemy's C2 network [From FP]
Improve multi-echelon EA capability [From FP]

II

Real-time high data rate intel processing/analysis tailored to user
Real-time distributed access to National Resources
Recon in support of target acquisition
Intel processing/analysis transparent to user
Battlefield 3D visualization systems
Land/Sea preview/rehearsal, all levels (the individual Marine to MEF) within 48h of tasking
Conduct mission planning in distributed environ

III

Special operations
Multi-modal distributed battlefield sensors

IV

One meter position/location accuracy
Convert counter intelligence
Improve quality/quantity of HUMINT
Low cost position/condition reporting system for individuals
Real-time access to dynamic terrain data base

FIGURE B-4. EXPEDITIONARY WARFARE S&T ROUNDTABLE I - COMMAND AND CONTROL

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WARFIGHTING THRUST AREA: Training and Education

SUPPORTING REQUIREMENTS:

I

Interoperable, distributed, embedded for all combat systems
Increased realism/availabilty in deployed/garrison environment
Decision-making training

II

Test and evaluation: virtual prototyping [From CSS]

III

Make machines/systems easier to learn
Manpower management

IV

Improve teaching methods
Increased education availability

FIGURE B-5. EXPEDITIONARY WARFARE S&T ROUNDTABLE I - TRAINING AND EDUCATION

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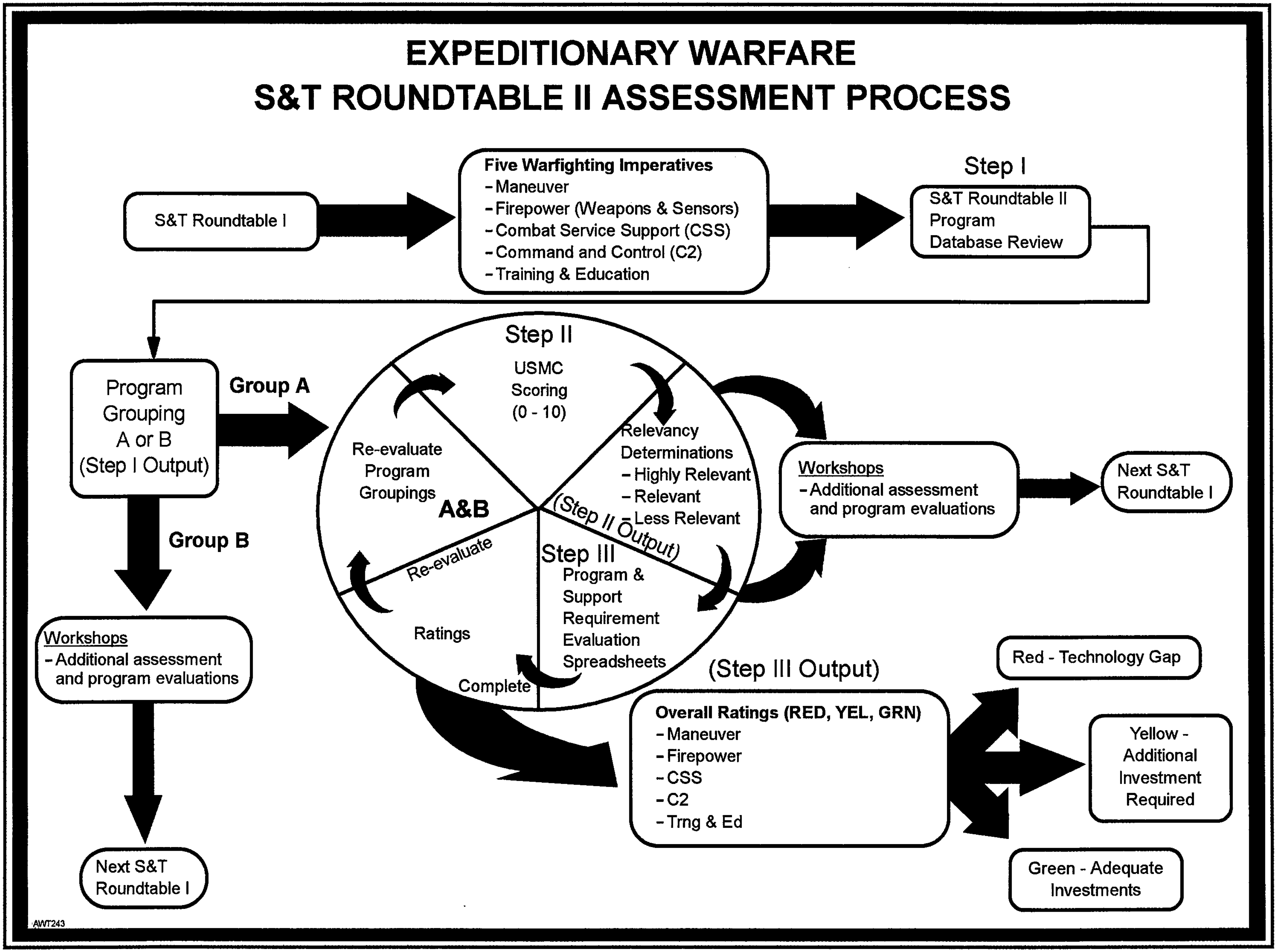

FIGURE B-6. EXPEDITIONARY WARFARE S&T ROUNDTABLE II ASSESSMENT PROCESS

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STEP 3

MCCDC participated in a joint assessment. First, based upon scoring in Step 2, programs were ranked as: Group "A" (highly relevant, relevant, less relevant) or Group "B" (all other programs). Second, spreadsheets were built and program support requirements evaluated. Third, program groupings "A" and "B" were re-evaluated. Fourth, Step 3 output was briefed to MCCDC and any necessary adjustments were made. Overall ratings (Red, Yellow, or Green) were assigned. Figure B-7 is a sample of this output.

STEP 4

Final S&T assessments were briefed to MARCORSYSCOM and CG MCCDC in anticipation of an out-brief to the Strategic Vision Selection Authority (SVSA).

Figure B-8 summarizes the overall Marine Corps S&T program and the relative position in the Department of Defense (DoD) fabric. The total investment by DoD component is the left vertical axis arrayed against the horizontal axis that represents the five Warfighting Imperatives broken down into the top two quartiles of the roundtable. The right vertical axis depicts how the total DoD component investment is divided among the imperatives above it. Along the bottom, total dollars invested by quartile/by imperative is shown along with a color-coded visual representation of "investment wellness." One would conclude from this that CSS is the most underfunded of all imperatives. Other assessment highlights include:

a. Yellow in Maneuver indicates investment required for in-stride obstacle breaching while under fire, vehicle structures survivable to blast/kinetic penetration, in-stride gap crossing, high-area rate stand-off recon, and improved lightweight body armor.

b. Green in Firepower indicates adequate investment which must be maintained until supporting requirements are met.

c. Red in Combat Service Support reflects a deficiency in technology programs to provide modeling and simulation support, amphibious lift (design for seabasing), reduction of consumables (less ammunition), embedded self diagnostics, and disposable technology.

d. Yellow in Command and Control at this time is because Army classified programs are being reviewed for potential requirements support. The process is ongoing, but we believe there is adequate investment in this area.

e. Yellow in Training and Education indicates investment required in decision-making training and test and evaluation: virtual prototyping.

The Expeditionary Warfare Roundtable developed two architectures; one based on mission areas (MA) and supporting functions for the time frame of 7-20 years and one based on capabilities and supporting functions for the time frame 25+ years. The 7-20 years analysis was

based on the standard 20 MAs for which the MCCDC conducts regular analyses. The 25+ years analysis was based on a proposal by the Deputy CG MCCDC in which seven specific capabilities were articulated. In both cases, 7-20 years and 25+ year time frames, MAs and capabilities were prioritized into quartiles both to facilitate analysis of the lines of data and to enable decisions that will ultimately define funding and support. Figures B-9 through B-11 illustrate the final quartilization.

Spreadsheet Example

EXPEDITIONARY WARFARE S&T ROUNDTABLE MATRIX

			SUPPORTING REQUIREMENTS				
			QUARTILE I				
			A1	A2	B	C	D
NO.	I. MANEUVER IMPERATIVE	ORIG. DATA BASE	Full recon in surf/beach zone	Full neutralization in surf/beach zone	Instride obstacle breaching while under fire	Breaching assets as mobile force	Neutralization of advanced/hardened mines
	OVERALL RATING:		Y	G	R	Y	G
	Highly Relevant:						
1	Explosive Neutralization	42		x		x	x
2	Joint Countermine ACTD	52		x		x	x
3	MCM Mining and Special Warfare	64		x			x
4	Naval Special Warfare	71	x	x			
5	Surf Zone Technology	93		x	x		x
6	COBRA	209	x				
7	Distributed Explosive Technology	215		x			x
8	JAMC	223		x			x
9	Mine Detection Technology	229	x				
10	ORSMC	230				x	x

AWT243

FIGURE B-7. SPREADSHEET EXAMPLE, EXPEDITIONARY WARFARE S&T ROUNDTABLE MATRIX

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Expeditionary Warfare Science and Technology Investments (Draft) (30 May 96)

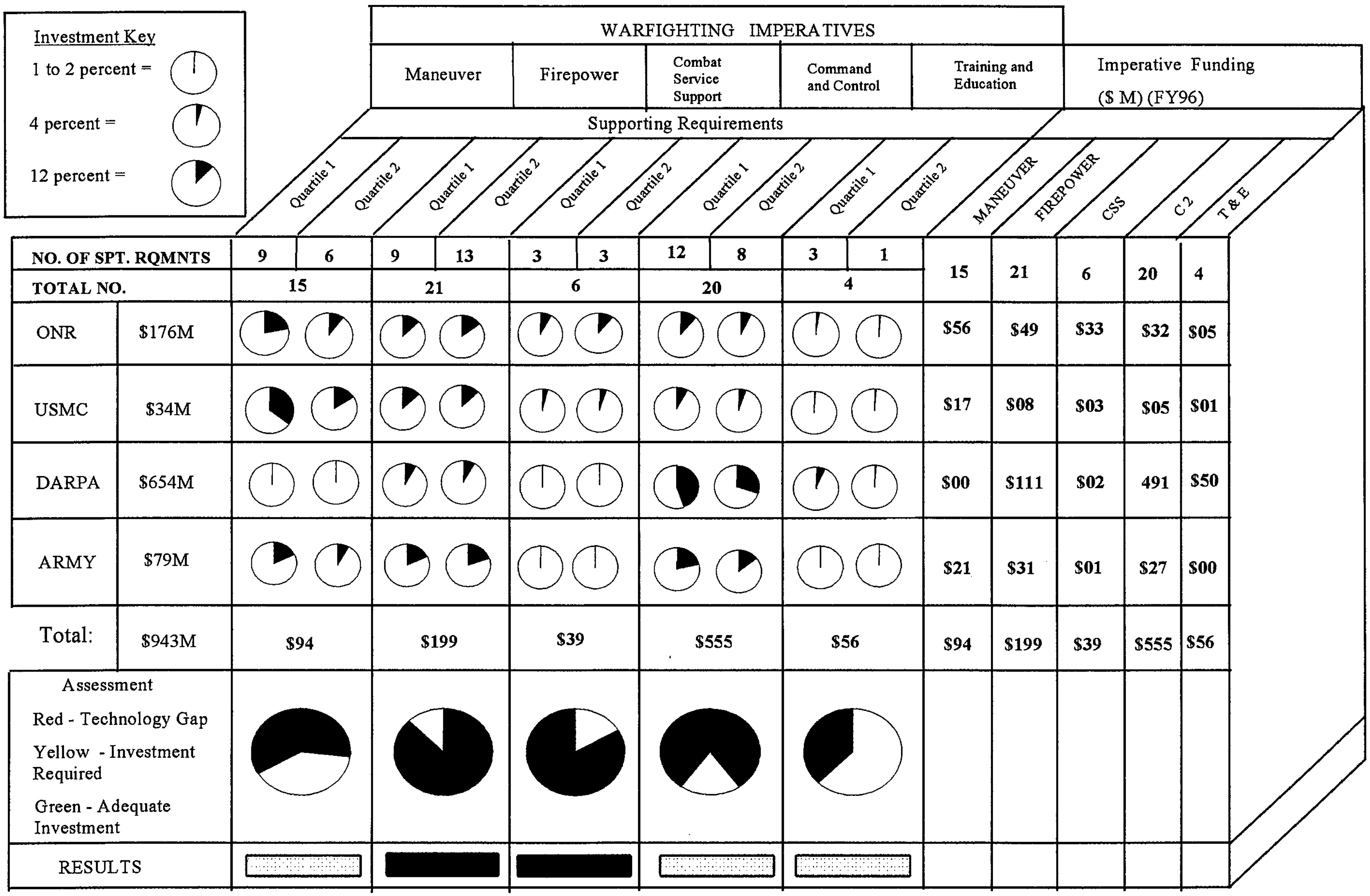

FIGURE B-8. EXPEDITIONARY WARFARE SCIENCE AND TECHNOLOGY INVESTMENTS

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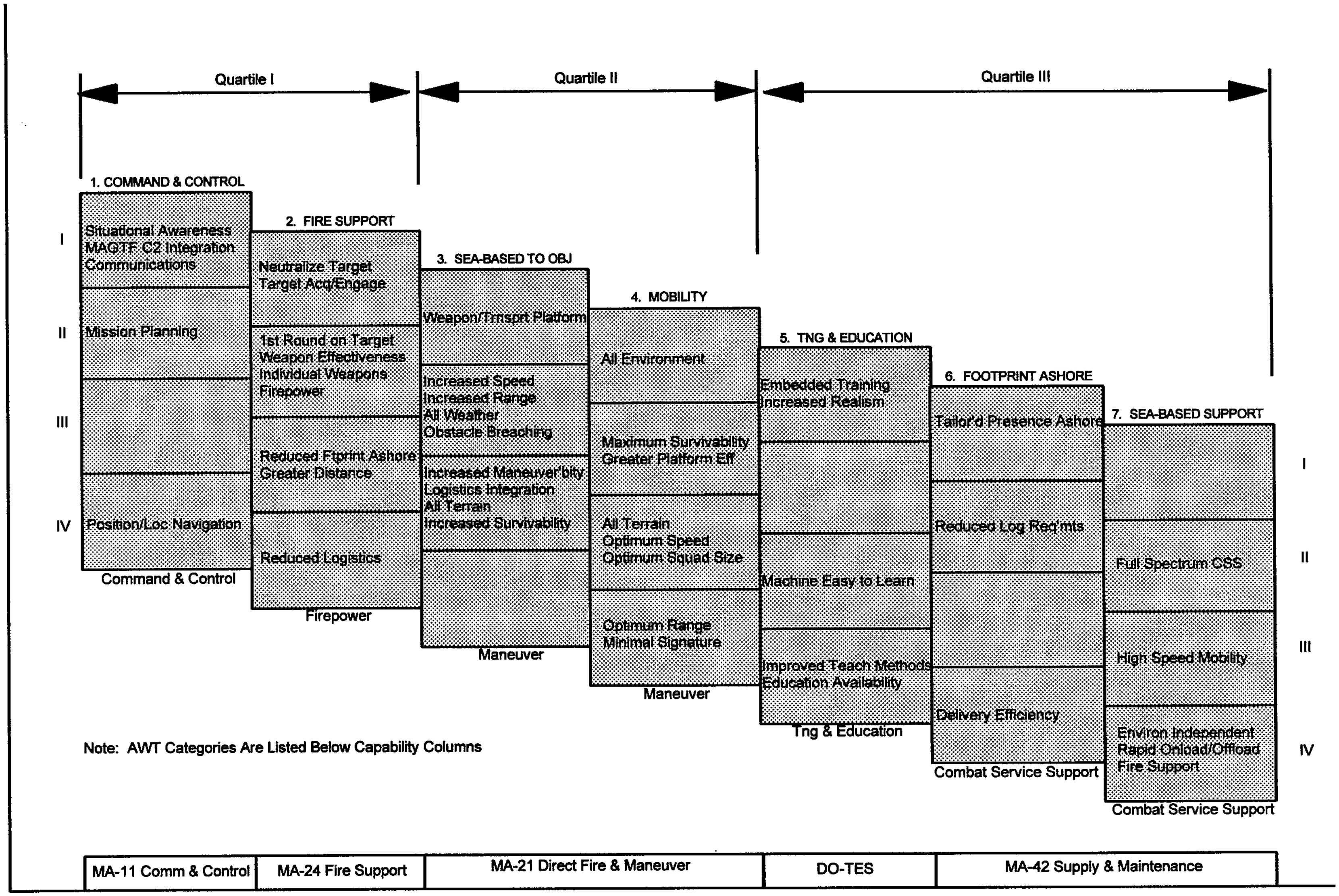

FIGURE B-9. PRIORITIZED CAPABILITIES AND SUPPORTING FUNCTIONS
25+ YEARS

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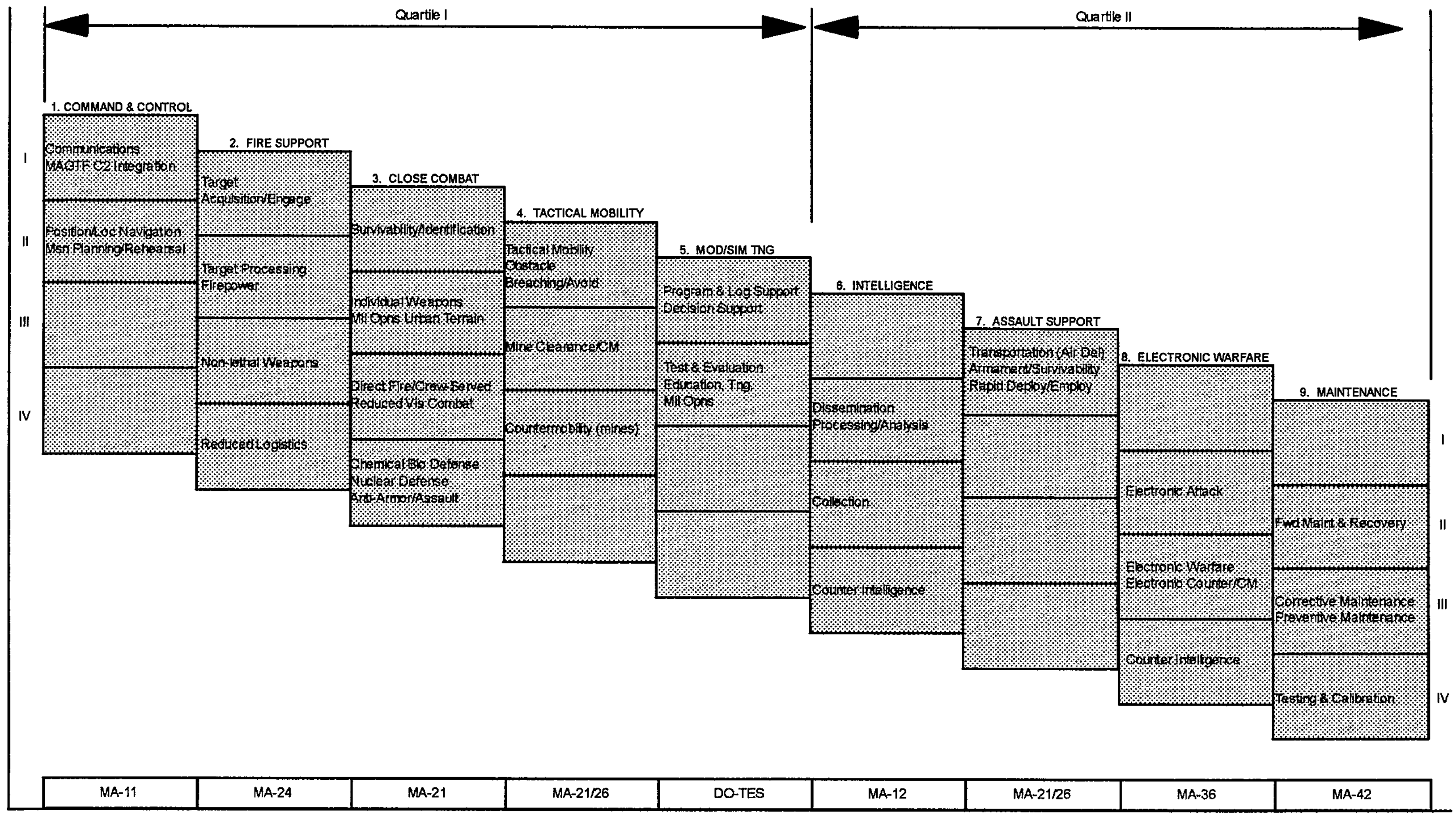

FIGURE B-10. PRIORITIZED MISSION AREAS/SUPPORTING FUNCTIONS
7 TO 20 YEARS

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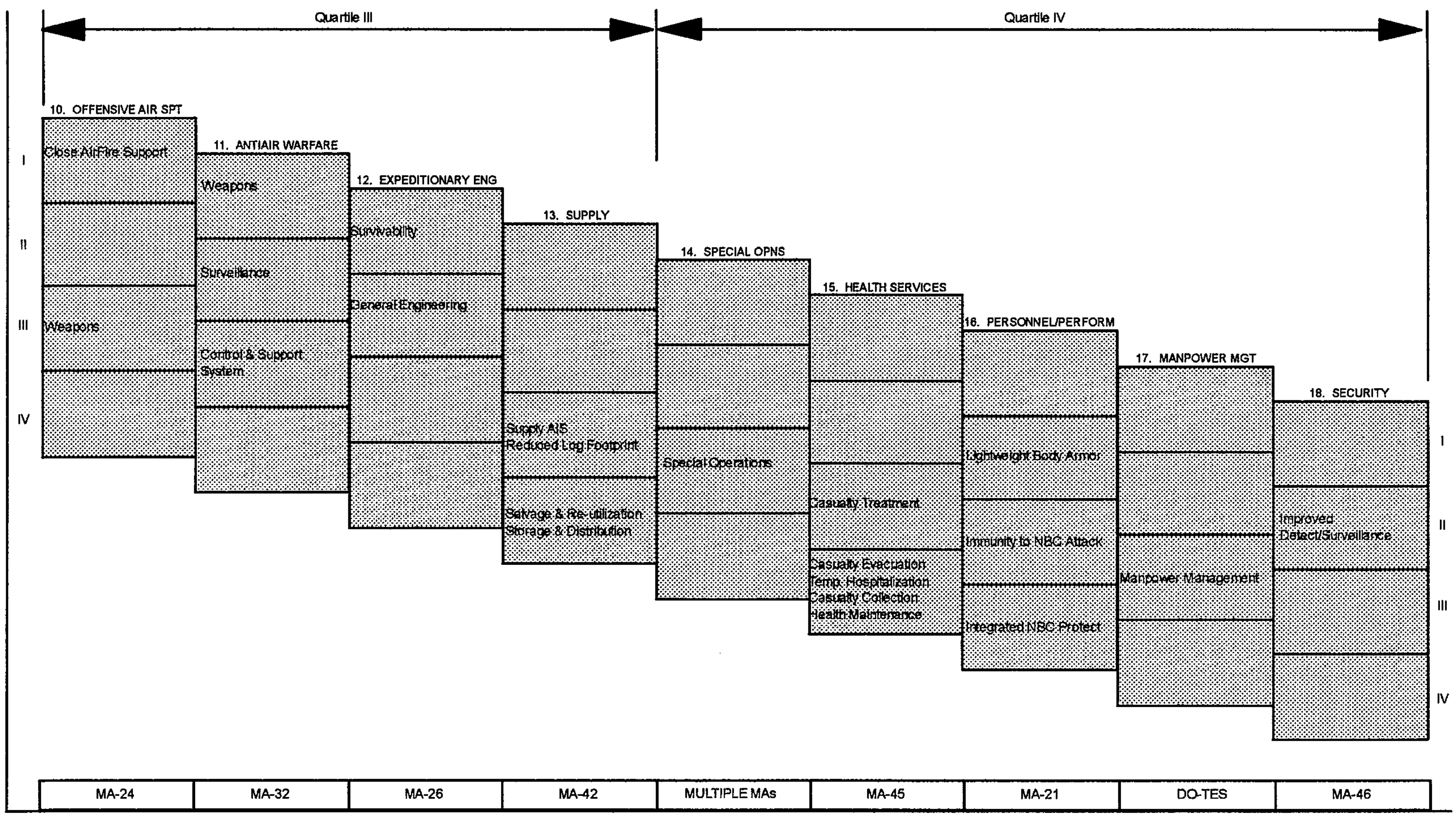

FIGURE B-11. PRIORITIZED MISSION AREAS/SUPPORTING FUNCTIONS
7 TO 20 YEARS

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ANNEX C

GLOSSARY OF TERMS

A&Q	Alert and Cueing
AAAV	Advanced Amphibious Assault Vehicle
AAFS	Advanced Amphibious Fuel Systems
AAL	Advanced Amphibious Logistics
AAP	Amphibious Assault Planner
AAV	Amphibious Assault Vehicle
AAW	Anti-Air Warfare
ABT	Advanced Breaching Technologies
ACAT	Acquisition Category
ACE	Aviation Combat Element
ACS	Advanced Countermine System
ACTD	Advanced Concepts Technology Demonstration
AD	Air Defense
ADATS	Air Defense Anti-Tank System
AECSS	Advanced Expeditionary Combat Service Support
AEDT	Articulated Electric Drive Trailer
AFB	Air Force Base
AFC	Advanced Fire Control
AFOE	Assault Follow-on Echelon
AHM	Anti-Helicopter Mine
AHMCM	Anti-Helicopter Mine Countermeasures
AIEWS	Advanced Integrated Electronic Warfare System
AIT	Advanced Identification Techniques
ALGW	Advanced Lightweight Ground Weaponry
ANS	Artificial Neural Systems
APADS	Advanced Palletized Air Delivery System
APS	Advanced Propulsion System
APWSF	Advanced Processors for Weapon Sensor Fusion
AQHUD	Alert and Cueing Head Up Display
ARDEC	Armament Research, Development, and Engineering Center
ARL	Army Research Laboratory
ASAD	Advanced Systems for Air Defense
ASCIET	All Service Combat Identification Evaluation Team
ASDP	Acoustic Sensor Development Platform
ASTAMIDS	Airborne Standoff Mine Field Detection System
ATACMS	Army Tactical Missile System
ATAS	Acoustic Target Acquisition System
ATD	Advanced Technology Development (or Demonstration)
ATHS	Automatic Target Handoff System

ATR	Automatic Target Recognition
AVS	Advanced Visionics System
AW	Amphibious Warfare
AWE	Advanced Warfighting Experiment
AWT	Amphibious Warfare Technology
AZ	Azimuth
BAA	Broad Agency Announcement
BADD	Battlefield Awareness and Data Distribution
BASIS	Battlefield Acoustic Sensor Integration System
BASS	Battlefield Acoustic Sensor System
BC	Battlefield Combat
BCID	Battlefield Combat Identification
BDCM	Brushless Direct Current Motor
BDSD	Battlefield Distributed Simulation Demonstration
BF	Beam Forming
BLRSI	Battle Lab Reconfigurable Simulator Initiative
BMP	Battlefield Marker Panel
BRDEC	Belvoir Research, Development, and Engineering Center
C2	Command and Control
C2W	C2 Warfare
C3	Command, Control and Communication
C4I	Command, Control, Communications, Computers and Intelligence
CARC	Chemical Agent Resistant Coating
CAS	Close Air Support
CASTFOREM	Combined Arms Team Force Model
CATT	Combined Arms Tactical Trainer
CAX	Combined Arms Exercise
CBRS	Concept Based Requirements System
CCH	Computer Controlled Hostiles
CCH/N	Computer Controlled Hostiles/Neutrals
CCIR	Commander's Critical Information Requirements
CCIRS	Commander's Critical Information Requirements System
CCS	Close Combat Surveillance
CCSST	Close Combat Surveillance Sensor Technology
CCTT	Close Combat Tactical Trainer
CDP	Combat Development Process
CDR	Critical Design Review
CE	Command Element

GLOSSARY OF TERMS (CONTINUED)

CECOM	Communication - Electronics Command
CEIL	Combat Essential Items List
CERMET	Ceramic-metal
CIFS	Close In Fire Support
CLASS	Closed Loop Artillery Simulation System
CLW	Century Land Warrior
CLZ	Craft Landing Zone
CMC	Commandant of the Marine Corps
COA	Course of Action
COAA	Course of Action Analysis
COASIM	COA Simulator
COBRA	Coastal Battlefield Reconnaissance and Analysis
COC	Combat Operations Center
COC(I)	Combat Operations Center-Interim
COE	Common Operating Environment
COE	Concept of Employment
COMPASS	Common Operational Modeling Planning and Simulation System
CONOPS	Concepts of Operation
COTS	Commercial Off the Shelf
CoVRT	Commander's Visualization Research Tool
CPAC	Corrosion Prevention And Control
CPATR	Concurrent Paradigm-based Automatic Target Recognition
CPFF	Cost Plus Fixed Fee
CPG	Commandant's Planning Guidance
CRT	Cathode Ray Tube
CSS	Coastal Systems Station
CSS	Combat Service Support
CSS	Capability Support System
CSSC2	Combat Service Support Command and Control
CSSCS	Combat Service Support Control System
CSSD	Combat Service Support Detachment
CSSE	Combat Service Support Element
CSSOC	Combat Service Support Operations Center
CTA	Cognitive Task Analysis
CVC	Combat Vehicle Crew
CW	Continuous Wave
DACT	Digital Automated Communications Terminal
DARPA	Defense Advanced Research Projects Agency
DBBL	Dismounted Battlespace Battle Lab
DBC	Digital Battlefield Communication

DBE	Database Engine
DBMS	Database Management System
DCG	Deputy Commanding General
DEM/VAL	Demonstration and Validation
DET	Distributed Explosive Technology
DEW	Directed Energy Weapon
DF	Direction Finding
DGPS	Differential Global Positioning System
DII	Digital Information Interface
DISA	Defense Information Systems Agency
DLN	Diamond-Like Nanocomposite
DMSO	Defense Modeling and Simulation Office
DNCPPG	Department of Navy Consolidated Planning and Programming Guidance
DOD	Department of Defense
DOTES	Doctrine, Organization, Training and Education, Equipment, and Support/Facilities
DPG	Defense Planning Guidance
DSP	Digital Signal Processing
DT	Developmental Test
DTED	Digital Terrain Elevation Data
DTP	Developmental Test Plan
DZ	Drop Zones
EADS	Expeditionary Air Defense System
EAGLE I	Enhanced Target Acquisition/Geo-Location Equipment Integration
EARS	Expandable Acoustic Remote Sensors
EBLT	Expeditionary Bulk Liquid Technologies
ECM	Electronic Countermeasures
ECP	Engineering Change Proposal
ECPT	Expeditionary Cargo Packaging Technologies
ECU	Environmental Control Unit
EET	Expeditionary Engineering Technologies
EFP	Explosively Formed Penetrator
EL	Elevation
ELT	Expeditionary Logistics Transporter
ELTV	Expeditionary Logistics Transport Vehicle
EMD	Engineering and Manufacturing Development
EO	Electro-Optic
EOD	Explosive Ordnance Disposal
ERDEC	Edgewood Research, Development, and Engineering Center
ESM	Electronic Support Measures

ESST	Engineering/Supply/Services Technologies
EUT	Early User Test
EV/EHV	Electric Vehicle/Electric Hybrid Vehicle
F..FTS	Forward from the Sea
FA	Fixed Artillery
FAAD	Forward Area Air Defense
FAC	Forward Air Controller
FCT	Foreign Comparative Testing
FCV	Future Combat Vehicle
FEBA	Forward Edge of the Battle Area
FFT	Fast Fourier Transform
FLCV	Future Light Combat Vehicle
FMF	Fleet Marine Force
FMFM	Fleet Marine Force Manual
FO	Forward Observer
FOG-M	Fiber Optic Guided Missile
FONS	Fleet Operational Need Statement
FORSCOM	Forces Command; Army
FOV	Field of View
FPA	Focal Plane Array
FSSG	Force Service Support Group
FSV	Future Scout Vehicle
FW	Fixed Wing
FXXI LW	Force XXI Land Warrior
FY	Fiscal Year
GBDL	Ground Based Data Link
GCCS	Global Command and Control System
GCE	Ground Combat Element
GCSS	Global Combat Service Support
GEN III	Generation III
GEN II	Generation II
GHz	Gigahertz
GOTS	Government Off the Shelf
GPS	Global Positioning System

HCI	Human Computer Interface
HDM	Hand Deployable Marker
HDR	High Data Rate
HMD	Helmet Mounted Display
HMMWV	High Mobility Multi-purpose Wheeled Vehicle
HOTAS	Hands-On-Throttle-And-Stick
HP	Hewlett Packard
HQMC	Headquarters Marine Corps
HQUSMC	Headquarters United States Marine Corp
HSLS	Handheld Signal Locating System
HTMMP	Helicopter Transportable Multi-Mission Platform

I/O	Input/Output
IBR	Investment Balance Review
IBV	In the Box Visibility
IC	Integrated Circuit
ICOC	Integrated Combat Operations Center
ID	Identification
IEW	Intelligence and Electronic Warfare
IEWD	Intelligence and Electronic Warfare Directorate
IFCS	Intelligent Fire Control Sensors
IFF	Identification Friend or Foe
IFSAS	Initial Fire Support Automation System
ILS	Integrated Logistics Support
IMF	Intelligent Mine Field
IMINT	Imagery Intelligence
IMU	Inertial Measurement Unit
IOC	Initial Operational Capability
IPL	Integrated Priority Lists
IPPD	Integrated Product/Process Development
IPR	In-Progress Reviews
IPT	Integrated Product Teams
IPV	In Process Visibility
IR	Infrared
ISO	International Standards Organization
ITV	In-Transit-Visibility
IUGS	Improved UGS
IW	Information Warfare

JAMC	Joint Amphibious Mine Countermeasures
JANUS	Force model; LLNL
JEPTP	Joint Electric Propulsion Technology Program
JHU/APL	Johns Hopkins University/Applied Physics Laboratory
JIEMD	Joint Integrated Electric Mobility Demonstrations
JMA/SA	Joint Mission Area / Support Area
JMASS	Joint Material Analysis Simulation System
JMAT	Joint Services Medium Caliber Automatic Cannon Technology
JMDT	Joint Mine Detection Technology
Joint M&S	Joint Modeling and Simulation
JORD	Joint Operational Requirements Document
JPO	Joint Project Office
JSIMS	Joint Simulation System
JSSAP	Joint Services Small Arms Program
JSZMC	Joint Surf Zone Mine Countermeasures
JT	Joint
JTC	Joint Tactical Communication
JTEV	Joint Tactical Electric Vehicle
JTIFF	Joint IFF
JWARS	Joint Warfare Analysis System
JWCA	Joint Warfighting Capability Area
KELT	Korean-English Language Translator
LAI	Light Armored Infantry
LAN	Local Area Network
LARC	Lighter Amphibious Resupply Cargo
LAV	Light Armored Vehicle
LCAC	Landing Craft Air Cushion
LCCT	Logistics Command and Control Technologies
LCD	Liquid Crystal Display
LCM	Landing Craft Mechanized
LCTF	Liquid Crystal Tunable Filters
LCU	Landing Craft Utility
LDR	Low Data Rate
LLNL	Lawrence Livermore National Laboratory
LLTV	Low-level Light Television
LNS	Land Navigation System
LOA	Letter of Agreement
LOB	Line of Bearing

LOGAIS	Logistics Automated Information Systems
LOGMARS	Logistics Marking and Reading System
LOS	Line of Sight
LPD	Landing Platform Dock
LPD	Low Probability of Detection
LPI	Low Probability of Interception
LRIP	Low Rate Initial Production
LST	Landing Ship Tank
LSV	Light Strike Vehicle
LUT	Limited User Testing
LVS	Logistics Vehicle System
LW	Land Warrior
LZ	Landing Zones
M&S	Modeling and Simulation
MA	Mission Areas
MAA	Mission Area Analysis
MAFSS	Mobile Automated Fire Support System
MAGTF	Marine Air-Ground Task Force
MAL	MAGTF Allowance List
MANPADS	Man Portable Air Defense System
MARCORSYSCOM	Marine Corps Systems Command
MARFOR	Marine Forces
MARFORLANT	Marine Forces; Atlantic
MARFORPAC	Marine Forces; Pacific
MASTS	Modeling and Simulation for Targeting Sensors
MBps	Megabytes-per-second
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCCDC	Marine Corps Combat Development Command
MCD	Mine, Countermine, and Demolition
MCLLS	Marine Corps Lessons Learned System
MCM	Mine Countermeasures
MCMIA	Mine Countermeasures Integration and Automation
MCMP	Marine Corps Master Plan
MCTSSA	Marine Corps Tactical Systems Support Activity
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MHz	Megahertz
MICSS	MAGTF Individual Combat Simulation System
MICOM	Missile Command

MIST	Minefield Image Synthesis Tool
MITLA	Micro-circuit Technology in Logistics Applications
MITRE	Massachusetts Institute of Technology Research and Engineering
MMW	Millimeter Wave
MNS	Mission Need Statement
MOA	Memorandum of Agreement
MOBA	Military Operations in Built-up Areas
MODSAF	Modular Semi-Automated Forces
MOU	Memorandum of Understanding
MOUT	Military Operations in Urbanized Terrain
MPF	Maritime Prepositioning Force
MS	Microsoft
MSBL	MAGTF C4I Software Baseline
MSSG	MEU Service Support Group
MTS	Marine Tactical System
MVDR	Minimum Variance Distortionless Response
NAPDD	Non-ACAT Program Definition Document
NATC	Nevada Automotive Test Center
NAWCTSD	Naval Air Warfare Center Training Services Division
NCCOSC	Naval Command and Control and Ocean Surveillance Center
NCTR	Non-Cooperative Target Recognition
NDI	Non-Developmental Item
NFESC	Naval Facilities Engineering Service Center
NIDL	National Information Display Laboratory
nm	Nanometer
NMS	National Military Strategy
NRaD	NCCOSC Research and Development Division
NRDEC	Natick Research, Development, and Engineering Center
NSFS	Naval Surface Fire Support
NSS	Naval Simulation System
NSS	National Security Strategy
NSWC	Naval Surface Warfare Center
NSWCDD	Naval Surface Warfare Center Dahlgren Division
NTC	National Training Center
NTCSS	Naval Tactical Command Support System
NTDR	Near Term Digital Radio
NVG	Night Vision Goggles

OEO	Other Expeditionary Operations
OMFTS	Operational Maneuver from the Sea
ONR	Office of Naval Research
OODA	Observation-Orientation-Decision-Action
OPNAV	Office of the Chief of Naval Operations
ORD	Operational Requirements Document
ORSM	Off-Route Smart Mine
ORSMC	Off-Route Smart Mine Clearance
OSD	Office of the Secretary of Defense
OT	Operational Testing
OTH	Over The Horizon
OTH COMM	Over-the-horizon Communications
OTM	On-the-move
OTS	Off the Shelf

P^3I	Pre-Planned Product Improvement
PC	Patrol Craft
PC	Personal Computer
PCS	Personal Communication System
PDR	Preliminary Design Review
PE	Program Element
PEI	Principal End Items
PEO	Program Executive Office
PEO MIW	Program Executive Office Mine Warfare
PILLAR	Portable Imaging Lightweight Laser Radar
PM	Program Manager
PM AD	PM for AIR Defense
PM-CBG	PM for Ground Weapons
PM Comm	Program Manager for Communications
PM INTEL	PM for Intelligence Systems
PM-LAV	PM for LAV
PMS	Pedestal Mounted Stinger
POM	Program Objective Memorandum
POP	Proof of Principle
PPBS	Planning, Programming, and Budgeting System
PPQT	Pre-Production Qualification Testing
PPU	Power Production Unit
PR	Program Review
PSAD	Passive Sensor for Air Defense
PSD	Propulsion System Demonstrator

R&D	Research & Development
RADEL	Radio Label
RAM-D	Reliability, Availability, Maintainability-Durability
RDBMS	Relational DBMS
RDEC	Research, Development, and Engineering Center
RDT&E	Research, Development, Test, and Evaluation
REBAR	Reinforcing Bars
RF	Radio Frequency
RFC	Rapid Follow-on Clearance
RFI	Request for Information
RFID	Radio Frequency Identification
RFP	Request for Proposals
RFPI	Rapid Force Projection Initiative
RIS	Range Instrumentation System
RISC	Reduced Instruction Set Computer
ROC	Required Operational Capability
RREP	Radio Reconnaissance Equipment Program
RRT	Radio Reconnaissance Teams
RRTS	Rapid Request Tracking System
RSTA	Reconnaissance, Surveillance, and Target Acquisition
RSV	Reconnaissance Scout Vehicle
RT	Roundtable
RTLS	Remote Target Location Systems
RTM	Requirements Translation Model
RTT	Radio Tracking Technologies
RTU	Remote Terminal Unit
RW	Rotary Wing
S&T	Science and Technology
SBI	Simulated Biological Intelligence
SBIR	Small Business Innovative Research
SDS	Solution Development System
SECNAV	Secretary of the Navy
SGSS	Surrogate Ground Sensor System
SHORAD	Shore-based Air Defense
SIDS	Secondary Imagery Dissemination System
SINCGARS	Single Channel Ground-Air Radio System
SIPE	Soldier Integrated Protective Ensemble
SMAW	Shoulder-launched Multi-purpose Assault Weapon
SMDG	Stand-off Mine Detection, Ground
SOA	Sustained Operations Ashore

SOCOM	Special Operations Command
SOW	Statement of Work
SPAWAR	Space and Naval Warfare Systems Command
SPET-A	Spatial Processing Evaluation Tool for air Acoustics
SPMAGTF	Special Purpose MAGTF
SSMAC	Smart Standoff Mine Active Countermeasures
SST	Seabasing Sustainment Technology
STAG	Smart Tactical Autonomous Guidance
STMP	Science and Technology Master Plan
STRICOM	Simulation, Training, and Instrumentation Command
SVSA	Strategic Vision Selection Authority
SWMCM	Shallow Water Mine Counter-Measures

T/O	Table of Organization
T&E	Test and Evaluation
TAC	Tactical Computer
TACAN	Tactical Air Control and Navigation
TACFIRE	Tactical Fire
TACLOG	Tactical - Logistical
TACOM	Tank and Automotive Command
TAD	Theater Air Defense
TAOC	Tactical Air Operations Center
TARDEC	Tank-Automotive Research, Development, and Engineering Center
TAV	Total Asset Visibility
TD	Technology Demonstration
TEAMS	Technology Evaluation Assessment Modeling and Simulation
TEMP	Test and Evaluation Master Plan
TEVT	Tactical and Electric Vehicle Technology
TFMC	Tunable Filter Multi-spectral Camera
TI	Technical Insertion
TLD	Top Level Demonstration
TOC	Tactical Operations Center
TPP	Technology Program Plan
TRADOC	Training and Doctrine Command; Army
TRAP	Tactical Recovery of Aircraft and Personnel
TRSS	Tactical Remote Sensor System
TTES	Team Target Engagement Simulator
TTO	Tactical Technology Office

UAV	Unmanned Aerial Vehicle
UFL	ULCHI Focus Lens
UGS	Unattended Ground Sensors
USC	United States Code
USMC	United States Marine Corps
UTED	Ultra Wide Band Tactical Electronic Devices
UTO	Unit Task Organization
UV	Ultraviolet
UWB	Ultra Wideband
UXO	Unexploded Ordnance
VLS	Vehicle Landmine Survivability
WAM	Wide Area Mine
WES	Waterway Experiment Station
WIN	Wireless Link Interrogator Network
WP	White Phosphorous
WSMR	White Sands Missile Range
WTI	Weapons and Tactics Instruction

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ANNEX D

NON-ACQUISITION CATEGORY PROGRAM DEFINITION DOCUMENT (NAPDD)

CONTENTS

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NON-ACQUISITION CATEGORY (NON-ACAT)
PROGRAM DEFINITION DOCUMENT (NAPDD)

for

COASTAL BATTLEFIELD RECONNAISSANCE AND ANALYSIS (COBRA)

NAPDD NO. 9304

PE 0603640M

Project C2079

SUBMITTED

Director, AWT, MARCORSYSCOM

2 June 93
Date

REVIEWED:

Director, Requirements Division MCCDC

6 June 93
Date

APPROVED:

Commander, MARCORSYSCOM

22 June 93
Date

TASKING:

MARCORSYSCOM
ASSIGNED SYSCOM

Date

OASN (RD&A) DEPUTY FOR EFP

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

COASTAL BATTLEFIELD RECONNAISSANCE AND ANALYSIS (COBRA)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

1. PURPOSE/INTENT OF EFFORT.

The purpose of this ATD is to demonstrate in an operational environment the utility of incorporating advanced multispectral imaging sensors into an Unmanned Aerial Vehicle (UAV) to achieve capabilities for coastal reconnaissance of the beach area, Craft Landing Zone (CLZ), and inland. Detection of obstacles, fortifications, vehicles, minefields, and mines prior to and during an amphibious assault and land combat operations, as well as terrain analysis in littoral areas, will be demonstrated. The ATD goals and notional requirements are stated in Enclosure (1).

a. BACKGROUND. The Marine Corps has an urgent and continuing need for the capability of remotely performing beach reconnaissance for mobility assessment. The detection of all types of land mines during operations from the very shallow water/surf zone to inland is critical. A technique is needed to detect mines in areas to be entered by tactical units at a rate which will not impede mobility, and in a way that personnel will not be exposed to undue risk. Sensor and emerging processing technology was demonstrated in the Marine Corps Standoff Mine Detection Ground (SMDG) program during FY90-FY92.

b. SYSTEM REQUIREMENTS AND CONCEPT DESCRIPTION. Prior to an amphibious assault, real time beach reconnaissance, including mine detection, is required. The beach reconnaissance system will consist of multispectral imaging sensors deployed in an UAV. The enhanced sensors deployed will include a multispectral camera boresighted with an Infrared (IR) camera such as the Low Cost Uncooled Sensor Prototype (LOCUSP). High resolution imagery of the ground, in video format, will be collected in flight and transmitted to a ground station for processing. Another goal is for image processing to provide near real time automatic target recognition (ATR) of all target classes, with the detection/recognition of small, uncooperative targets in high clutter as the technical driver. An operational assessment will demonstrate utility of this concept under quasi-operational conditions.

2. SCOPE OF EFFORT.

The technical approach will be to use the Pioneer UAV as a test platform to mount the multispectral sensors. Coordination of plans and integration has been made with the UAV JPO. The Marine Corps has made a substantial investment in the Pioneer program and already has a significant data base. The UAV sensor development effort and the extensive image processing required for target detection will build on sensor and processing technology developed in the Marine Corps Mine Detection Exploratory Development (6.2) programs. The sensor development will be modular to permit upgrades as sensor technology evolves and UAV's with larger payloads become available. The ATD program will proceed in phased developments. This effort has joint potential with Navy and Army mine detection requirements.

a. Phase I. The first phase will integrate the existing SMDG multispectral camera and a thermal IR video camera into a Pioneer UAV. Both have been previously flight tested in a UH-60. A baseline reconnaissance capability will be established by conducting field tests with targets located in a variety of natural (cluttered) backgrounds. Test data will be processed with current image processing assets and analyzed to establish performance capability baselines and to define enhanced requirements.

b. Phase II. The second phase will develop an enhanced sensor and optics package optimized for the Pioneer operational environment. Leading issues include optimization of mission scenario, data link, advanced image processing hardware and software for airborne and ground station processing, optical and mechanical issues for coregistration of the multispectral and thermal images, and calibration and normalization of the images. Critical technical issues will be addresses through an extensive series of Developmental Tests supported by extensive performance modeling.

c. Phase III. The enhanced sensor, data link, and processing packages will be fabricated. Enhanced reconnaissance capabilities will be evaluated in an early operational assessment conducted by Fleet Marine Force (FMF) units. Performance modeling will predict advanced sensor requirements for a follow-on ATD or for transition to Demonstration and Validation, as appropriate.

3. RESOURCE SUMMARY.

($000)	FY93	FY94	FY95	FY96	FY97	FY98
6.2	500	500				
6.3A	2,000	2,000	2,000			
6.3B				2,000	3,000	2,000

4. ATD DELIVERABLES/MILESTONES

a. Phase I: Baseline Field Tests with Sensor Technologies.

DELIVERABLE/MILESTONE	SCHEDULE
Program Initiation	2QTRFY93
Technology Management Plan	2QTRFY93
Airframe/Integration Design Review	2QTRFY93
Test Execution, Baseline Demonstration	3QTRFY93
Technology Assessment and Tradeoffs (Advanced Sensor)	3QTRFY93
Enhanced Sensor Design Concept	3QTRFY93
Test Results and Analysis	4QTRFY93
Baseline Performance Report	4QTRFY93
Image Processor Technical Requirement Definition	4QTRFY93
Enhanced Sensor Design Review	4QTRFY93
Beach Reconnaissance Mission Analysis	4QTRFY93

b. Phase II: Enhanced Sensor Test.

DELIVERABLE/MILESTONE	SCHEDULE
Mission Need Statement (Draft)	1QTRFY94
Developmental Test Plan (DT-0)	1QTRFY94
Enhanced Sensor Fabrication and Checkout	1QTRFY94
Sensor Component Testing (DT-0)	2QTRFY94
Data Analysis	3QTRFY94
Advanced Sensor Design/Tradeoff Study	3QTRFY94
Transition Plan	3QTRFY94
DT-0 Report	4QTRFY94
Mission Need Statement Approval	4QTRFY94
Milestone 0	4QTRFY94

c. Phase III: Enhanced Sensor Early Operational Assessment.

DELIVERABLE/MILESTONE	SCHEDULE
Operational Test Plan (OT-0)	2QTRFY95
Integrated Program Summary	2QTRFY95
Enhanced Sensor/Processing Packages Fabricated and Installed; Pioneer Training	3QTRFY95
Operational Testing (OT-0)	3QTRFY95
Early Operational Assessment (OT-0) Report	3QTRFY95
Cost and Operational Effectiveness Analysis	4QTRFY95
Operational Requirement Document	4QTRFY95
Milestone I	1QTRFY96

5. PROGRAM REVIEWS.

In addition to event driven reviews, the Director AWT will conduct progress and financial reviews triannually, beginning four months after program initiation.

6. TRANSITION.

See Enclosure (2), Transition Planning Worksheet.

7. ENCLOSURES.

Enclosure (1): COBRA ATD Goals and Requirements
Enclosure (2): Transition Planning Worksheet (TPW)

COASTAL BATTLEFIELD RECONNAISSANCE AND ANALYSIS (COBRA)

ATD GOALS AND REQUIREMENTS

CATEGORY	ATD GOALS	NOTIONAL REQUIREMENTS
Airborne Platform	Pioneer	UAV (TBD)
Multispectral Camera System	Enhanced SMDG Camera	Hybrid Multispectral / Electro-Optic
Thermal IR Camera	LOCUSP or Commercial	Coregistered with MS and other sensors
Data link / Navigation	Single Video Link / Video Navigation	Dual Band Video / Differential GPS
Image Coregistration	Automated / Post Processing	Automated / Near Real Time
Image Processing for Mine Detection	Recorded, Ground Based Post Processing	Data Linked / Near Real Time
Operating Environment	Daytime Only	Day / Night
Operational Area	Surf Zone to Inland	Surf Zone to Inland
Altitude	500 ft	5000 ft
Speed	60 knots	120 knots
Coverage / Rate	Fixed, 20° Swath 1.36 nm^2/hr	Scanned, 45° Swath 81.8 nm^2/hr
Mine Detection	12" Surface 12" Buried	6" Surface 12" Buried
Obstacle / Fortification Detection	Human Analysis	Automated
PD (Mine Field)	.8 (Surface) .7 (Buried)	.9 (Surface) .75 (Buried)
Pfa (Mine Field)	0.3	0

Enclosure (1)

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TRANSITION PLANNING WORKSHEET

PROGRAM: ADVANCED AIRBORNE IMAGING SENSORS FOR BEACH RECONNAISSANCE
ORIGINATOR: MARCORSYSCOM (AWT)
TYPE: USMC ACAT: NON-ACAT
ORIG DATE: 19 JAN 93 REV DATE: ______

PHASE / MILESTONE	FY93 1 2 3 4	FY94 1 2 3 4	FY95 1 2 3 4	FY96 1 2 3 4	FY97 1 2 3 4	FY98 1 2 3 4	RESP/ REMARKS
6.2 Exploratory Development	---------	---------	---------				AWT
6.3a Advanced Technology Demonstration	---------	---------	---------				AWT
Technical Documentation	---------	---------	---------				CSS
Mission Need Statement	D	F					MCCDC
Integrated Program Summary		D	F				AWT / PM Intell
Cost and Operational Effectiveness Analysis			D F				MCCDC
Operational Requirement Document			D F				MCCDC
Marine Corps Program Decision Meeting (0-I)		M		M			AWT / PM Intell
Demonstration and Validation				---------	---------	---------	PM Intell

Legend: (M) - Milestone, (---) - Timeline, (D) - Draft document, (F) - Final document

FUNDING	FY93	FY94	FY95	FY96	FY97	FY98	RESP / REMARKS
6.2 / SBIR	500	500					AWT
6.3a (NON-ACAT)	2,000	2,000	2,000				AWT
6.3b - 6.4				2,000	3,000	2,000	PM Intell
Other							
Procurement							
Total (USMC)							

OBJECTIVE:

To incorporate advanced multispectral imaging sensors into an Unmanned Aerial Vehicle (UAV) to demonstrate capabilities for beach reconnaissance, specifically for the detection of obstacles, fortifications, vehicles, mines, and for terrain analysis prior to an amphibious assault.

Enclosure (2)

STATUS:

(1) Leverages ongoing USMC Standoff Mind Detection Ground (SMDG) development.

(2) Leverages USMC investment in Pioneer UAV.

(3) Advanced Sensor/Image Processing development. Support is provided by a parallel USMC 6.2 Exploratory Development task performed at the Coastal Systems Station.

PROJECT POC:

LtCol W. Hamm, Marine Corps Systems Command (AWT), 703-784-4790, DSN 278
Mr. N. Witherspoon, Coastal Systems Station, 904-234-4998, DSN 436
Maj Tonnacliff, MARCORSYSCOM (PM Intell), 703-784-2581, DSN 278

NON-ACQUISITION CATEGORY (NON-ACAT)
PROGRAM DEFINITION DOCUMENT (NAPDD)

JOINT AMPHIBIOUS MINE COUNTERMEASURES (JAMC)

NAPDD NO.

PE 0603640M Project C2078

SUBMITTED:

Director, AWT, MARCORSYSCOM — 22 March 94 Date

REVIEWED:

Director, Requirements Division, MCCDC — 26 Apr 94 Date

APPROVED:

Commander, MARCORSYSCOM — 5/18/94 Date

TASKING:

Marine Corps Systems Command

ASSIGNED SYSCOM

ASN ~~(RD&A),~~ or Deputy for EFP — 940627 Date

AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VA 22134

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

JOINT AMPHIBIOUS MINE COUNTERMEASURES (JAMC)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

1. PURPOSE/INTENT OF EFFORT.

The JAMC ATD will demonstrate integrated mine countermeasures concepts to neutralize wire obstacles and land mines on the beach and approaches during an amphibious assault. The JAMC program will provide a near term (<five years) capability. JAMC will be used to clear the final portion of the amphibious assault lane from the beach zone into the Craft Landing Zone (CLZ). The demonstration will support the development of doctrine embodied in draft Tactical Memorandum (TACMEMO) PZ6022-1-94/Operational handbook (OH) 1-17 for Shallow Water Mine Countermeasures.

a. Background. OMFTS requires U.S. Naval Forces to have the capability to defeat enemy measures designed to prevent amphibious assault landings. A cheap and effective component of coastal defense are barriers employing mines and complex obstacles. Although avoidance of these areas as landing sites is generally the preferred choice, local conditions in some cases will make crossing the barriers the best alternative available. In these cases, the Navy and Marines must create cleared lanes of passage from the assault force at sea to the inland CLZs. JAMC will address the beach zone of these lanes.

MCM systems to address this area in the far term, are now being developed through the Navy Shallow Water MCM (SWMCM) Program. In addition, there are a variety of technologies and systems currently fielded for clearing mines and obstacles on land and in the water. While none of these current mechanical, explosive, or electromagnetic systems are adequate in the surf and beach areas, certain systems have a limited MCM capability in this unique operational area if properly adapted. These existing system technologies and selected other low risk technologies will provide the basis for the JAMC technical approach.

b. System Requirements and Concept Description. The JAMC system must be capable of providing cleared lanes for the initial assault wave of the landing force within the designated areas, for rapid follow on clearance to allow force buildup on the beach, and for support of the initial movement inland. Such an operation may require deliberate breaching.

JAMC neutralization characteristics and ATD goals and notional requirements are provided in Enclosure (1).

2. SCOPE OF EFFORT.

To support the immediate need of a system fieldable within the near term, this ATD will develop, integrate, and demonstrate mechanical, explosive, and electromagnetic MCM technologies. Personnel and platform survivability technologies to provide a capability for countering the spectrum of threat mines and obstacles in a number of operational scenarios will also be investigated and demonstrated. Major technical efforts include: optimizing existing MCM technologies; developing and demonstrating low risk MCM technical concepts; developing and demonstrating remote control capability for the platform; and, integrating survivability package and MCM technologies with mobility platforms.

Conceptually, JAMC will consist of a prime mover properly armored and configured to operate mechanical breaching and explosive clearing systems. The prime mover will be controlled remotely at a safe standoff. It will come ashore in a naval craft and conduct obstacle reduction/mine field breaching on the beach and its approaches.

a. System Concept Development. The individual and combined technical capabilities of the system and its components depend upon several variables such as relative importance of various mine types, obstacle types, sensitivity to width of beach barrier, etc. Based upon these and other known technical criteria, this phase will identify and evaluate candidate systems/subsystems for the JAMC project. Operational and technical modeling of systems effectiveness will aid in the evaluation of the technical performance required of the system components. The product of this phase will be selection of the technical concepts for further development and integration as the JAMC system.

b. System Design and Fabrication. The selected system/subsystem concepts will be designed, fabricated, and integrated into a flexible JAMC system. A demonstration model will be fabricated and extensive component and subsystem test and evaluation will be done. Modeling and Simulation will be heavily employed in support of both design and evaluation.

c. Platform Integration. Subsystems and components will be integrated on the demonstration platform and verified for form, fit, and function. Initial system technical evaluation will be conducted.

d. Test and Evaluation. The system and subsystems will undergo formal Developmental Testing consistent with the development phase of the program. Modeling and simulation will be employed.

e. Demonstration. Operational Testing will demonstrate the capabilities to user organizations and allow users to gain familiarity with the system concept.

3. RESOURCE SUMMARY.

Financial summary of the JAMC program is as listed in the table below.

($000)	FY94	FY95	FY96	FY97	FY98	FY99
6.3a	3,489	3,703				
6.4			4,010	2,763	1,010	
PMC				123	6,676	26,568

4. DELIVERABLES/MILESTONES

a. ATD.

DELIVERABLE/MILESTONE	SCHEDULE
Technical Management Plan	2QTRFY94
Technical Concept Selection	2QTRFY94
Preliminary Design Review	2QTRFY94
Critical Design Review	4QTRFY94
Transition Plan	4QTRFY94
Developmental Test (DT-0) Plan	1QTRFY95
Developmental Model Design/Fabrication Completion	2QTRFY95
Developmental Test (DT-0)	2QTRFY95
Operational Test (OT-0) Plan	3QTRFY95
DT-0 Report	3QTRFY95
Platform Integration Completion	3QTRFY95
Operational Test (OT-0)/Project Demonstration	4QTRFY95
OT-0 Report	4QTRFY95
Final ATD Report/Performance Specification	4QTRFY95
Technical Documentation	4QTRFY95
Program/Milestone I Documentation	4QTRFY95

b. Other.

DELIVERABLE/MILESTONE	SCHEDULE
Mission Need Statement Approval	1QTRFY92
Milestone 0	1QTRFY92
Life Cycle Cost Estimate	1QTRFY95
Cost and Operational Effectiveness Analysis	1QTRFY95
Operational Requirement Document Approval	3QTRFY95
Milestone I	1QTRFY96

5. PROGRAM REVIEWS.

Both event driven reviews and regularly scheduled reviews will be conducted for this ATD. The Director AWT will conduct In Progress Reviews (IPR) triannually beginning four months after program initiation. Event driven reviews such as Preliminary and Critical Design Reviews will precede major technical and program decisions and may supplement or supersede the triannual IPR schedule. Program progress will be briefed and a written report submitted by the Technical Development Activity (TDA) at both scheduled and event driven reviews. Program financial status reports will be provided to the Director AWT on a monthly basis.

6. TRANSITION.

A transition plan for transition of the ATD to the appropriate Program Manager for management will be developed. In the Demonstration and Validation (DEMVAL) phase, this program will be a formal joint Marine/Navy program with the Marine Corps as the lead service. POM96 initiatives for DEMVAL and Engineering and Manufacturing Development (EMD) phases and procurement have been submitted by the Marine Corps.

7. ENCLOSURES.

Enclosure (1): JAMC ATD Goals and Requirements
Enclosure (2): Transition Planning Worksheet (TPW)

JOINT AMPHIBIOUS MINE COUNTERMEASURES (JAMC)

ATD GOALS AND REQUIREMENTS

CHARACTERISTICS	ATD GOALS	REQUIREMENTS
Mine Threat	All mine types; 5" soil overburden	All mine types; 8" soil overburden
Clearing Effectiveness	90% mines cleared; Breach light obstacles	95% mines cleared; Breach light obstacles
Area Clearance	50m x 50m in 1.5 hr	50m x 150m in 1.5 hr; (multiple systems)
Controls	All functions/Vehicle remote with man in the loop	Teleoperation, semi-autonomous
Survivability	Small arms: TBD* Artillery: TBD* Antitank (AT) Mines: TBD*	Small arms: 14.6mm @ 100m Artillery: 155mm burst AT Mines: 3 detonations
Operating Environment	Day/Night Limited weather Line of sight Beach area Standard fording depths	Day/Night All weather Line of sight Littoral region Standard fording depths

* Testing and modeling at component level

Enclosure (1)

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TRANSITION PLANNING WORKSHEET

PROGRAM: JOINT AMPHIBIOUS MINE COUNTERMEASURES (JAMC)
ORIGINATOR: MARCORSYSCOM (AWT)
TYPE: USMC — ACAT: NON-ACAT
ORIG DATE: 5 JAN 94 — REV DATE: ______

PHASE / MILESTONE	FY94 1 2 3 4	FY95 1 2 3 4	FY96 1 2 3 4	FY97 1 2 3 4	FY98 1 2 3 4	FY99 1 2 3 4	RESP/ REMARKS
6.3a Advanced Technology Demonstration	---------	--------- T					AWT
Marine Corps Program Decision Meeting (0, I, II/III)	M		M	M			AWT/PM SSE
Mission Need Statement	F						MCCDC
Operational Requirement Document	D	F					MCCDC
6.3 through Fielding			---------	---------	---------	---------	PM SSE
IOC/FOC					I	F	PM SSE

Legend: (M) - Milestone, (---) - Timeline, (D) - Draft document, (F) - Final document, (T) - transfer to PM

FUNDING ($000)	FY93	FY94	FY95	FY96	FY97	FY98	FY99	RESP / REMARKS
6.3a (NON-ACAT)	403	3,489	3,703					AWT
6.4				4,010	2,763	1,010		PM Engr Sys
Procurement					123	6,676	26,568	PM Engr Sys
Total (USMC)	403	3,489	3,703	4,010	9,466	15,503	12,023	48,587

Estimated Unit Price - TBD

Estimated Acquisition Objective - TBD

OBJECTIVE:

To demonstrate individual and integrated mine countermeasures technical concepts to neutralize light obstacles and land mines in preparation for a vehicle mounted amphibious assault by Marines.

ISSUES:

(1) Operational concepts need to be fully defined.

Enclosure (2)

STATUS:

(1) 6.3a ATD development is underway and on schedule.

PROJECT POC:

LtCol W. Hamm, Marine Corps Systems Command (AWT), 703-784-4790, DSN 278
Mr. A. Nease, Wright Laboratory, Tyndall AFB, 904-283-3726
Maj R. Miller, MARCORSYSCOM (SSE), 703-784-2242, DSN 278
Maj M. O'Mahoney, MCCDC, 703-784-2554, DSN 278

NON-ACQUISITION CATEGORY (NON-ACAT)
PROGRAM DEFINITION DOCUMENT (NAPDD)

ADVANCE TECHNOLOGY DEMONSTRATION
FOR
OFF ROUTE SMART MINE CLEARANCE (ORSMC)

NAPDD NO. __________

PE 0603640M **Project C2078**

SUBMITTED:

Director, AWT, MARCORSYSCOM Date 22 March 94

REVIEWED:

Director, Requirements Division MCCDC 26 Apr 94
Date

APPROVED:

Commander, MARCORSYSCOM 5/12/94
Date

TASKING:

MARCORSYSCOM 940628
ASSIGNED SYSCOM Date

ASN ~~(RD&A)~~, DEPUTY FOR EFP

AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VA. 22134

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

OFF ROUTE SMART MINE CLEARANCE (ORSMC)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

1. PURPOSE/INTENT OF EFFORT.

The purpose of the ORSMC ATD is to demonstrate integrated countermeasures technologies to neutralize the emerging threat of off route smart mines. A primary focus will be technical and integration risk reduction leading to a transition to the demonstraton/validation phase of development at milestone I. The program is a jointly funded Army and Marine effort that addresses the ORSMC needs of both medium and heavy forces on the modern battlefield. ORSMC will help maintain full combat power and enhance the survivability of combat and logistical vehicles within the full spectrum of land combat levels and environments, including expeditionary warfare from the sea.

a. Background. Modern doctrine of expeditionary and maneuver warfare requires high levels of mobility and maneuver in all combat levels, environments and situations. The advent of off route smart mines creates a new and significant threat to the capabilities of Army/Marine armored, mechanized, and mounted forces. Advances in sensor and digital signal processing (DSP) technologies are resulting in the Top Attack Anti-Tank Mine (TAATM) which will be capable of target identification, tracking, and engagement at ranges of 100 meters or more. They feature powerful on board DSPs, multimode sensors, and the ability to attack vehicles at extended ranges, typically with a two stage system. The ground platform stage uses acoustic, seismic, or other sensors and the DSP to autonomously detect, classify, track, and plot a fire control solution for vehicle targets. The sublet stage, launched by the ground platform, uses its own infrared (IR) and/or millimeter wave (MMW) sensors, and the DSP to fire an explosively formed penetrator (EFP) to defeat the vehicle's vulnerable upper armor. With sensor and DSP technologies necessary for the development and fielding of smart mine systems currently available, and a number of development threat programs underway, threat countries may deploy smart mine systems as early as 1998. Conventional mine clearing techniques such as line charges, plows, rollers, etc., will not be effective against smart, standoff mine systems. A Joint MARCORSYSCOM/BRDEC 6.2 project has successfully demonstrated technology feasibility of deception techniques to replicate acoustic and seismic signatures of potential targets to initiate a premature launch of the smart mines.

b. System Requirements and Concept Description. An ORSMC system must be capable of clearing/neutralizing smart mines at a rate that supports combat operations (in stride) and with sufficient survivability to men and equipment to maintain required combat power. The ORSMC system will be used as a precursor to breaching a mine field with conventional mine clearing equipment, or to preclude the ambush effectiveness of smart mines. The goal of the ATD is to demonstrate countermeasure techniques to defeat off route smart mines and to maintain a low probability of vehicle kill by the mine. The ATD countermeasure concept will consist of:

(1) acquisition, tracking, and fire control sensor deception techniques using acoustic and seismic signals generated remotely by various means; and,

(2) integration with a platform with technology for enhanced survivability against the smart mine projectile and terminal sensor.

Enclosure (1) provides ATD goals and notional operational requirements.

2. SCOPE OF EFFORT.

The scope of this ATD effort will be to define characteristics and vulnerabilities of smart mine systems and to develop and demonstrate integrated countermeasures techniques to neutralize them at safe standoff by generating the required false signatures to cause a smart mine to erroneously alert, track, and launch its sublet. Survivability of the host platform will be enhanced by various technologies to survive or spoof the terminal sensors utilized by the sublet. Risk factors for the critical technologies and their integration will be identified at the start of the ATD and used to guide risk reduction efforts.

a. Countermeasure Technique Development. Acoustic subsystem development will use multisource configuration and synthetically engineered signatures to simulate acoustic signatures of combat vehicles. This simulation will be accurate in frequency content, spatial distribution, and trend. The seismic subsystem generates high amplitude seismic signatures from a moving vehicle chassis. The mechanically produced seismic waves will exhibit convincing frequency distributions and trends. The ORSMC system (with platform) will be designed to exhibit sufficiently low signatures such that any sublet, regardless of the accuracy of its initial fire control solution, will be unable to detect and target it or will fire on a false target through use of deception. Candidate technologies will be drawn from related DoD technology efforts.

b. Threat Mine Emulator (TME). The TME will be developed as an integral test device for ORSMC system demonstration, because threat mine targets are not available. The TME will be infinitely flexible and will emulate the toughest ensemble of threat mine sensors and signal processing available for the emerging threat. The TME will be validated versus real world target vehicles and will be demonstrated for its accurate and reliable discrimination between target and non-target vehicles, as well as its ability to successfully engage the targets with both the ground sensor platform and the sublet.

c. Countermeasure System Integration. The acoustic reproduction subsystem, the seismic reproduction subsystem, and the platform will be sufficiently integrated to allow demonstration of a bread board ORSMC system in a field environment. The platform will be a high mobility vehicular chassis, fitted with a remote control operating system as adapted from other sources. The integrated system will demonstrate its ability to reliably cause functioning of the smart mine ground sensor systems, cause a sublet launch, and evade or survive the sublet attack.

3. RESOURCE SUMMARY.

($000)	FY93	FY94	FY95	FY96	FY97	FY98
USMC (6.2/6.3a)	1,420	1,228	1,570	2,348		
USMC (6.3b)					3,202	4,119
USA (6.2/6.3a)	1,500	1,200	2,700	2,200		
USA (6.3b)						7,000

4. DELIVERABLES/MILESTONES

a. ATD.

DELIVERABLE/MILESTONE	SCHEDULE
Program Initiation	1QTRFY94
ATD Technology Management Plan	2QTRFY94
In Progress Review	2QTRFY94
Technical Concept(s) Selection	4QTRFY94
Preliminary Design Review	2QTRFY95
Critical Design Review	4QTRFY95
Transition Plan	4QTRFY95
Developmental (DT-0) and Operational Test (OT-0) Plans	1QTRFY96
Developmental Model Design/Fabrication Completion	2QTRFY96
Platform Integration Completion	3QTRFY96
Draft Milestone I Documentation	3QTRFY96
DT-0	3QTRFY96
OT-0	4QTRFY96
DT-0 and OT-0 Test Reports	4QTRFY96
Final ATD Report/Performance Specification	4QTRFY96

b. Other.

DELIVERABLE/MILESTONE	SCHEDULE
Mission Need Statement Approval	3QTRFY94
Milestone 0	3QTRFY94
Army/Marine Memorandum of Agreement	4QTRFY94
Life Cycle Cost Estimate	3QTRFY96
Cost and Operational Effectiveness Analysis	4QTRFY96
Operational Requirement Document Approval	4QTRFY96
Milestone I	1QTRFY97

5. PROGRAM REVIEWS.

Both event driven reviews and regularly scheduled reviews will be conducted for this ATD. The Director AWT will conduct In Progress Reviews (IPR) triannually beginning four months after program initiation. Event driven reviews such as Preliminary and Critical Design Reviews will precede major technical and program decisions and may supplement or supersede the triannual IPR schedule. Program progress will be briefed and a written report submitted by the TDA at both scheduled and event driven reviews. Program financial status reports will be provided to the Director AWT on a monthly basis.

6. TRANSITION.

A transition plan for transition of the ATD to the appropriate PM for management will be developed. In the DEMVAL phase, this program will be a formal joint Army/Marine program with the Army as the lead Service. POM96 initiatives for DEMVAL and EMD phases have been submitted by both Services.

7. ENCLOSURES.

Enclosure (1): ORMSC ATD Goals and Requirements
Enclosure (2): Transition Planning Worksheet (TPW)

OFF ROUTE SMART MINE CLEARANCE (ORSMC)

ATD GOALS AND REQUIREMENTS

CHARACTERISTICS	ATD GOALS	REQUIREMENTS
Mine Threat	All smart mines*	All smart mines
Neutralization Probability	Neutralize 90% of mines (TME); 100m radius	Neutralize 95% of mines from a distance commensurate with threat system capabilities
Vehicle Speed	10 mph	Compatible with combat vehicle tactical operations
Control	All functions/Vehicle remote control with man in the loop	Robotic/semi-autonomous deployment
Survivability	Less than 0.25 probability of ORSMC vehicle kill after warhead launch	Less than 0.05 probability of ORSMC vehicle kill after warhead launch
Operating Environment	Day/Night All weather Limited terrain	Day/Night All weather All terrain

* Based on component testing and simulation

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TRANSITION PLANNING WORKSHEET

PROGRAM: OFF ROUTE SMART MINE CLEARANCE (ORSMC)
ORIGINATOR: MARCORSYSCOM (AWT)
TYPE: JOINT USMC/ARMY, ARMY TECHNICAL LEAD ACAT: NON-ACAT
ORIG DATE: 4 JAN 94 REV DATE: ______

PHASE / MILESTONE	FY93 1 2 3 4	FY94 1 2 3 4	FY95 1 2 3 4	FY96 1 2 3 4	FY97 1 2 3 4	FY98 1 2 3 4	RESP/ REMARKS
6.2 Exploratory Development	---------						AWT/BRDEC
6.3a Advanced Technology Demonstration		---------	---------	---------			AWT/BRDEC
DT-0				M			AWT/BRDEC
OT-0				M			AWT/BRDEC
Technical Documentation		---------	---------	----------			AWT/BRDEC
Mission Need Statement		D	F				MCCDC/USAES
Operational Requirement Document			D	F			MCCDC/USAES
Marine Corps Program Decision Meeting (0-I)		M			M		PM ENG/ PM MCD
6.3b thru Fielding				---------	---------	---------	PM ENG/ PM MCD
IOC/FOC							

Legend: (M) - Milestone, (---) - Timeline, (D) - Draft document, (F) - Final document

FUNDING ($000)	FY93	FY94	FY95	FY96	FY97	FY98	RESP / REMARKS
6.2	1,420						AWT
6.3a (NON-ACAT)		1,228	1,570	2,348			AWT
6.3b					3,202	4,119	PM ENG
6.2 Army	1,500	1,200	1,700				BRDEC
6.3a Army			1,000	2,200			BRDEC
6.3b Army						7,000	PM MCD
Total	2,920	2,428	4,270	4,548	3,202	11,119	

Estimated Unit Price: TBD Estimated Acquisition Objective: TBD

Enclosure (2)

OBJECTIVE:

To develop and demonstrate the technologies and concepts to neutralize advanced top attack antitank mine systems. This will clear the way for obstacle breaching and LOC clearing operations as well as enhance overall force mobility and survivability for heavy and light forces.

STATUS:

6.2 Conducted Acoustic/Seismic Countermeasures Technology Demonstration on May 1993. Joint ATD initiated in 1QTRFY94.

PROJECT POC:

LtCol W. Hamm, Marine Corps Systems Command (AWT), 703-784-4790, DSN 278
Mr. G. Buhrman, BRDEC, 703-704-2435
Maj R. Miller, MARCORSYSCOM (SSE), 703-784-2242, DSN 278
Maj D. Knight, MCCDC, 703-784-3324, DSN 278

NON-ACQUISITION CATEGORY PROGRAM DEFINITION DOCUMENT (NAPDD)

for

JOINT INTEGRATED ELECTRIC MOBILITY DEMONSTRATIONS (JIEMD)

NAPDD NO. __________

PE 063640M

DRAFT

Submitted:

_______________________________ __________

Director, AWT, MARCORSYSCOM Date

Reviewed:

_______________________________ __________

Director, Requirements Division, MCCDC Date

Approved:

_______________________________ __________

Commander, MARCORSYSCOM Date

AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134-5080

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

JOINT INTEGRATED ELECTRIC MOBILITY DEMONSTRATIONS (JIEMD)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

1. Purpose/Intent of Effort.

The JIEMD ATD project will demonstrate the synergistic effect of electric vehicle propulsion and electric subsystem technologies in enhancing overall force mobility leading to the successful accomplishment of future missions and goals. Beginning with the development of conceptual models, performance analyses are conducted. The JIEMD program develops modeling and simulation (M&S) tools, provides avenues for technology insertion/transfer, and fabricates and tests full scale electric technologies.

a. Background. The United States Marine Corps' "*Operational Maneuver from the Sea*" (OMFTS) is a concept for projecting naval power ashore in support of a strategic objective. It renews emphasis on littoral operations, focusing on the capability to operate in a seamless manner from seaward bases to inland objectives. Maneuver warfare, including the mobility of logistics assets, will now be waged on all fronts across the littoral with combat forces moving swiftly to exploit their superior mobility and projection of power. To achieve these improvements in maneuverability and lethality of the combat force, as well as the mobility of support functions, several advanced electric propulsion and subsystem technologies are being developed throughout the defense and commercial community. Breakthroughs in the generating, distributing, and controlling of electric power have brought advancements in propulsion, armament, and survivability systems. These technological advancements, when applied to future system concepts, will enhance and help realize the successful conduct of OMFTS operations.

b. System Requirements and Concept Description. The JIEMD program introduces advanced electric propulsion and subsystem technology into future platform and vehicle concepts to evaluate overall system performance, cost, and operational suitability. The implementing strategy will start with the analysis of user capabilities projected into the operational time frame. Future concepts of operation will be examined to determine performance, mission, and equipment capabilities. These capabilities will be used to generate a wide range of deployment concepts, platforms, and systems. These concepts will be analyzed using M&S tools to determine overall performance and capability to successfully meet mission goals. As the M&S techniques refine and focus the system concepts and related development efforts mature the technology, demonstrations will be conducted. Demonstrations will consist of computer based simulations,

interactive virtual models, and laboratory bench tests and mock-ups. These demonstrations will lead to distributed integrated systems, M&S laboratory tools, technology transfer, and preliminary designs.

c. Related Efforts. This program will include analysis, modeling, simulation, demonstration, and testing of several technologies transitioning from Basic Research tasks, other complimentary technology base efforts, and advanced land combat cooperative efforts conducted jointly with the Army, the Advanced Research Projects Agency (ARPA), and the US Special Operations Command (USSOCOM).

2. Scope of Effort.

The technical approach will be a gradual transition from computer based concepting techniques to physics and operational based M&S evaluations of preliminary designs. Initial efforts will consist of developing system level concepts, performing M&S analyses, evaluating cost and performance benefits, and demonstrating electric technology through simulations and laboratory bench tests. As technologies mature and concepts are further refined, later efforts will concentrate on preliminary designs of system platforms and eventual virtual prototyping of the designs to evaluate functional capabilities and operational suitability.

3. Resources Summary.

($000)	FY94	FY95	FY96	FY97	FY98
6.3A		1,803	2,000	2,500	

4. ATD Deliverables/Milestones.

The following ATD objectives are listed with their associated schedule:

DELIVERABLE/MILESTONE	SCHEDULE
Technology Survey	4QTRFY95
Early Operational Assessment	1QTRFY97
Concept(s) Development	2QTRFY97
Preliminary Design Review (Phase 1)	2QTRFY97
Trade-off Analyses	2QTRFY97
Modeling and Simulation	3QTRFY97
Critical Design Review (Phase 1)	4QTRFY97

5. Other Deliverables/Milestones.

The following assets associated with the JIEMD program and other related efforts are listed below along with their respective schedule:

DELIVERABLE/MILESTONE	SCHEDULE
Technology Survey and Program Plan	4QTRFY95
Modeling and Simulation Master Plan	4QTRFY96
Developmental and Operational Test Plan	4QTRFY96
Conceptual Systems Report	3QTRFY97
Final Conceptual Design Report	3QTRFY97
Demonstration Plan	4QTRFY97

6. Program Reviews.

In addition to event driven reviews, the Director, AWT will conduct progress and financial reviews tri-annually.

7. Transitions.

See Enclosure (2), Transition Planning Worksheet.

8. Attached Enclosures.

Enclosure (1): ATD Goals and Notional Requirements
Enclosure (2): Transition Planning Worksheet

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JOINT INTEGRATED ELECTRIC MOBILITY DEMONSTRATION (JIEMD)

ATD GOALS AND REQUIREMENTS

Characteristic	ATD Goal	Requirements
Lightweight	15 % Weight Savings - Monolithic Aluminum, Chrom-Moly Tube frame	33% Weight Savings -Composites, Alumin/Composite Space Frame
Deployable	Heavy - C130/C141, LHD,LPD Medium - CH-53E Small - V-22	Heavy - C130/C141, LHD,LPD Medium - CH-53E Small - V-22
Survivable	Tailorable Armor Detection Avoidance	Tailorable Armor Detection Avoidance Silent Running
Affordability	Metal Structure/Armor (MSA) Cost	1.0 MSA Cost
Sustainment	2-3 Man Crew Increase Self-Sustained Minimize Logistics Burden	2 Man Crew Self-Sustained Just-in-Time Logistics
Mobility	= M1A1 MBT	Hyper-Mobility

Enclosure (1)

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Transition Planning Worksheet

Program: Joint Integrated Electric Mobility Demonstrations (JIEMD)
Originator: MARCORSYSCOM (AWT)
Type: USMC
Orig. Date: 8 February 95

ACAT: Non-ACAT
Rev Date: ________

Phase/MS	FY94	FY95	FY96	FY97	FY98	FY99	FY00	Resp./ Rema
6.2	----------	----------	----------	----------	----------			AWT/NSW
6.3A ATD		----------	----------	----------				AWT/NSW
Concepts		---------	---------	----------				AWT/NSW
Reviews			PDR	CDR				AWT/NSW
ORD				ORD				AWT/NSW
Perf. Spec.				A-Spec				AWT/NSW
DT/OT			OT-0	OT-0				AWT/NSW
MS			MS-0		MS-1			AWT/NSW

LEGEND: M - Milestone --- - Timeline D - Draft Document F - Final Document

Funding ($000)	FY94	FY95	FY96	FY97	FY98	FY99	FY00	Resp./ Rema
6.3A		1,803	2,000	2,500				AWT
Total		1,803	2,000	2,500				

Objective

To demonstrate advanced electric power technology and electrically powered subsystems for application on future combat and tactical vehicles concepts.

Status

(1) New Start for FY95

Issues

None

Enclosure (2)

Project Points of Contact

LtCol W. Hamm, MARCORSYSCOM (AWT); (703)784-4790, DSN 278
Mr. S. Ouimette, NSWC (Code 202); (301)227-4219, DSN 287

Enclosure (2)

NON-ACQUISITION CATEGORY (NON-ACAT)
PROGRAM DEFINITION DOCUMENT (NAPDD)

FOR

ADVANCED SYSTEMS FOR AIR DEFENSE

NAPDD NO. 9301

PE 0603640 PROJECT NO. C2080

SUBMITTED:

DIRECTOR, AWT/MARCORSYSCOM

16 Feb 93
Date

REVIEWED:

DIRECTOR, REQUIREMENTS DIVISION, MCCDC

17 Feb 93
Date

APPROVED:

COMMANDER, MARCORSYSCOM

3/19/93
Date

TASKING:

MARCORSYSCOM
ASSIGNED SYSCOM

31 MAR '93
Date

OASN(RD&A) DEPUTY FOR EFP

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

ADVANCED SYSTEMS FOR AIR DEFENSE (ASAD)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

1. PURPOSE/INTENT OF EFFORT.

Demonstrate technologies to provide a target acquisition capability for Avenger, LAV-AD, and Stinger Man Portable Air Defense System (MANPADS) fire units. The ability to passively detect, acquire, and classify fixed wing and rotary wing targets within the engagement envelop of the Short Range Air Defense (SHORAD) weapons systems will be demonstrated in an operational environment. This ATD will reduce technology risks and provide technology alternatives for the demonstration and validation phases of subsequent acquisitions.

a. Background. Air defense assets of the Marine Air Defense Battalion must be able to deliver defensive fires under all conditions. This requires the ability to provide fire units with early warning and timely acquisition of enemy targets. Attaining this goal in the absence of command and control, and without compromising one's own position, is essential to survivability. Visual acquisition and identification of targets are ineffective and rapidly diminishes with operator fatigue in adverse weather and during night operations. Avenger, LAV-AD, and MANPADS fire units all lack the capability to acquire and identify targets without being provided an external cue, or performing visual air search. The need for an organic passive sensor is identified in Marine Corps Mission Area Analysis 32 (Anti-Air Warfare); deficiencies 5. 7, 8, 10, and 13. The requirement is also identified in the MAGTF Air Defense Study of 27 July 1991. The MAGTF Ground Based Air Defense Implementation Planning Group which convened at Quantico, Virginia, 22-26 June 1992, validated the need to address these deficiencies. The Avenger MNS and ORD identify the requirement for passive sensors on that platform.

b. Status. This ATD transitioned technology from an exploratory development effort that demonstrated the potential of an on board alert and cue (A&Q) sensor for Avenger, LAV-AD, and MANPADS fire units. The ability to classify and identify targets was also evaluated. Work on the vehicle based sensor was in cooperation with the Army. The MANPADS work was conducted in house at NSWC Dahlgren, Virginia with industry support. The ASAD effort is fully coordinated with PM Aviation C2. This ATD is a new start in FY93 and will be managed by NSWC.

2. SCOPE OF EFFORT.

The leading technologies to be demonstrated are Electronic Support Measure (ESM) and acoustic Non-Imaging Sensors (NIS). Sensors adapted to vehicles will have application to both Avenger and LAV-AD fire units. ATD goals and notional requirements are presented in Enclosure (1). The objectives of this ATD include: (1) demonstrating the multisensor integration of ESM and NIS technologies on a moving vehicle; and, (2) demonstrating a man portable A&Q sensor capability for Stinger MANPADS that combines ESM and NIS technologies, that may permit growth potential to Non-Cooperative Target Recognition (NCTR). Army Forward Area Air Defense (FAAD) sensors (ESM and NIS NCTR, and the AN/VSX-1 passive IR) technology will be evaluated and possibly modified to meet notional requirements. The USMC Weapons Director Unit (WDU) will be used as the display and fusion device. ESM and NIS prototypes developed at NSWC will be used to demonstrate the desired capability for MANPADS. A Broad Agency Announcement will be used to solicit industry participation. PM Aviation C2 is the planned transition PM.

a. Avenger. For Avenger, this ATD will demonstrate a vehicle mounted NIS capability that can provide A&Q for Line Of Sight (LOS) and non-LOS rotary wing targets, and an ESM sensor to provide A&Q for LOS fixed and rotary wing targets. Performance will be evaluated under stationary and on the move conditions in an operational environment. The gunner will be provided with an integrated display of target information from all sensors. An early transition to an Avenger product improvement procurement in FY95 is anticipated by PM Aviation C2.

b. MANPADS. For Stinger MANPADS, this ATD will demonstrate a combined ESM/NIS sensor in a man-portable configuration that can provide the Stinger gunner an A&Q capability for fixed and rotary wing targets. Target information will be displayed and integrated into the MANPADS. Benefits gained over the unaided gunner (e.g., detection range, reaction time) will be evaluated. A limited NCTR capability will be evaluated.

3. RESOURCE SUMMARY.

FUNDING ($000)	FY92	FY93	FY94	FY95	FY96	FY97
6.2	535					
6.3a		750	1,000	2,000		
2.6			750	500	385	
6.3b					750	1,000
Procurement				5,000	3,500	5,000

4. ATD DELIVERABLES/MILESTONES

a. Avenger.

DELIVERABLE/MILESTONE	SCHEDULE
Program Initiation	1QTRFY93
Technology Development/Management Plan	2QTRFY93
Mission Need Statement	2QTRFY93
Milestone 0	4QTRFY93
Operational Requirement Document	1QTRFY94
Test and Evaluation Master Plan	2QTRFY94
Critical Design Review	3QTRFY94
Detailed Test Plan (DT/OT-0)	1QTRFY95
Integrated Program Summary	2QTRFY95
Cost and Operational Effectiveness Analysis	2QTRFY95
Life Cycle Cost Estimate	3QTRFY95
System Threat Assessment Report	3QTRFY95
Developmental Test (DT-0)	3QTRFY95
Operational Test (OT-0)	4QTRFY95
DT-0/OT-0 Report	4QTRFY95
Preliminary Integrated Logistics Support Plan	4QTRFY95
System Specification	4QTRFY95
Milestone I/III	4QTRFY95

b. MANPADS.

DELIVERABLE/MILESTONE	SCHEDULE
Program Initiation	1QTRFY93
Technology Development/Management Plan	2QTRFY93
Mission Need Statement	2QTRFY93
Milestone 0	4QTRFY94
Operational Requirement Document	1QTRFY94
Test and Evaluation Master Plan	4QTRFY94
Critical Design Review	4QTRFY95
Detailed Test Plan (DT/OT-0)	1QTRFY95

Integrated Program Summary	2QTRFY95
Cost and Operational Effectiveness Analysis	2QTRFY95
Life Cycle Cost Estimate	3QTRFY95
System Threat Assessment Report	3QTRFY95
Developmental Test (DT-0)	3QTRFY95
Operational Test (OT-0)	4QTRFY95
DT-0/OT-0 Report	4QTRFY95
Preliminary Integrated Logistics Support Plan	4QTRFY95
System Specification	4QTRFY95
Milestone I/III	1QTRFY96

5. PROGRAM REVIEWS.

In addition to event driven reviews, the Director AWT will conduct progress and financial reviews triannually beginning four months after program initiation.

6. TRANSITION.

7. ENCLOSURES.

Enclosure (1): Avenger ATD Goals and Requirements
Enclosure (2): Avenger Transition Planning Worksheet (TPW)
Enclosure (3): MANPADS ATD Goals and Requirements
Enclosure (4): MANPADS Transition Planning Worksheet (TPW)

ADVANCED SYSTEMS FOR AIR DEFENSE (ASAD)

AVENGER ATD GOALS AND REQUIREMENTS

PARAMETER	ATD GOAL	REQUIREMENT
Sensor type	Passive	Passive
Environment	Good conditions Day/Night Low ambient	All weather Day/Night Realistic ambient
Targets	Fixed wing (FW) Rotary wing (RW)	FW RW Unmanned Air Vehicle (UAV)
Azimuth coverage	360°	360°
Direction finding accuracy	+/- 10°	+/- 5°
Elevation field of view and elevation range	20°; 0° to +20°	30°; -5° to +25°
Non-cooperative target recognition	Classification	Identification Friend or Foe
Detection range	FW: 9 km RW: 6 km UAV: --	FW: 13 km RW: 9 km UAV: 4 km
Identification range	FW: 6 km RW: 5 km UAV: --	FW: 9 km RW: 7 km UAV: 3 km
Operational configuration	Stationary/operating	On the move

Enclosure (1)

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TRANSITION PLANNING WORKSHEET

PROGRAM: ADVANCED SYSTEMS FOR AIR DEFENSE (ASAD); AVENGER
ORIGINATOR: MARCORSYSCOM (AWT)
TYPE: USMC ACAT: NON-ACAT
ORIG DATE: 16 FEB 93 REV DATE: ______

PHASE / MILESTONE	FY92 1 2 3 4	FY93 1 2 3 4	FY94 1 2 3 4	FY95 1 2 3 4	FY96 1 2 3 4	FY97 1 2 3 4	RESP/ REMARKS
6.2 Exploratory Development	---------						AWT
6.3a Advanced Technology Demonstration		---------	---------	---------			AWT/PM C2A
Technical Documentation	---------	---------	---------	---------			NSWC-DD
Mission Need Statement		D F					MCCDC
Integrated Program Summary			D	F			AWT/PM C2A
Cost and Operational Effectiveness Analysis			D	F			MCCDC
Operational Requirement Document		D	F				MCCDC
Marine Corps Program Decision Meeting (0-II)		M		M			AWT/PM C2A
6.3b thru fielding					---------	---------	PM C2A

Legend: (M) - Milestone, (---) - Timeline, (D) - Draft document, (F) - Final document

FUNDING ($000)	FY92	FY93	FY94	FY95	FY96	FY97	RESP / REMARKS
6.2	535						AWT
6.3a (NON-ACAT)		335	700	1,200			AWT
6.3b - 6.4							
2.6			750	500	385		PM C2A
Procurement				5,000	3,500	5,000	PM C2A
Total (USMC)	535	335	1,450	6,700	3,885	5,000	

OBJECTIVE:

Demonstrate passive target acquisition for Avenger with the ability to classify and identify fixed and rotary wing targets from a moving vehicle.

Enclosure (2)

STATUS:

(1) This TPW applies to the vehicle task of the ASAD ATD.

(2) Efforts builds on a USMC 6.2 task completed in 4QTRFY92.

(3) Leverages ongoing Army development.

(4) IOC/FOC per Target Acquisition Master Plan.

(5) Responds to deficiencies addressed in MAA 32 (Anti-air Warfare).

(6) 2.6 resources are applied in support of the ATD and address lower risk technology and engineering tasks for passive sensors and P3I specific topics.

(7) Procurement resources are an allocation of the overall Avenger procurement.

(8) This ATD is a synergistic effort with PM C2A and is an enabling component of a larger Air Defense effort.

(9) Management handover to PM C2A is anticipated in FY95 for mature technologies.

(10) Anticipate direct adaptability of technologies to LAV-AD.

(11) The $535,000 of 6.2 money is the total FY92 6.2 investment in ASAD.

ISSUES:

None.

PROJECT POC:

LtCol W. Hamm, Marine Corps Systems Command (AWT), 703-784-4790, DSN 278
Mr. T. Saffos, NSWC-DD, 540-653-7361, DSN 249
Maj G. Wilkinson, MARCORSYSCOM (PM C2A), 703-784-2645/2232, DSN 278

ADVANCED SYSTEMS FOR AIR DEFENSE (ASAD)

STINGER MANPADS ATD GOALS AND REQUIREMENTS

PARAMETER	ATD GOAL	REQUIREMENT
Sensor type	Passive	Passive
Environment	Good conditions Day/Night Low ambient	All weather Day/Night Realistic ambient
Targets	Fixed wing (FW) Rotary wing (RW)	FW RW Unmanned Air Vehicle (UAV)
Azimuth coverage	360°	360°
Direction finding accuracy	+/- 15°	+/- 10°
Elevation field of view and elevation range	15°; 0° to +15°	20°; -5° to +15°
Non-cooperative target recognition	Classification	Identification
Detection range	FW: 7 km RW: 5 km UAV: --	FW: 10 km RW: 7 km UAV: 3 km
Identification range	FW: 5 km RW: 4 km UAV: --	FW: 6 km RW: 5 km UAV: 2 km
Operational configuration	Off vehicle	On/off vehicle

Enclosure (3)

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TRANSITION PLANNING WORKSHEET

PROGRAM: ADVANCED SYSTEMS FOR AIR DEFENSE (ASAD); MANPADS
ORIGINATOR: MARCORSYSCOM (AWT)
TYPE: USMC ADVANCED TECHNOLOGY DEMONSTRATION ACAT: NON-ACAT
ORIG DATE: 16 FEB 93 REV DATE: ______

PHASE / MILESTONE	FY92 1 2 3 4	FY93 1 2 3 4	FY94 1 2 3 4	FY95 1 2 3 4	FY96 1 2 3 4	FY97 1 2 3 4	RESP/ REMARKS
6.2 Exploratory Development	---------						AWT
6.3a Advanced Technology Demonstration		---------	---------	---------			AWT/PM C2A
Technical Documentation	---------	---------	---------	---------			NSWC-DD
Mission Need Statement		D F					MCCDC
Integrated Program Summary			D	F			AWT/PM C2A
Cost and Operational Effectiveness Analysis			D	F			MCCDC
Operational Requirement Document		D	F				MCCDC
Marine Corps Program Decision Meeting (0-I)		M			M		AWT/PM C2A
6.3b thru fielding					---------	---------	PM C2A

Legend: (M) - Milestone, (---) - Timeline, (D) - Draft document, (F) - Final document

FUNDING ($000)	FY92	FY93	FY94	FY95	FY96	FY97	RESP / REMARKS
6.2	535						AWT
6.3a (NON-ACAT)		415	300	800			AWT
6.3b - 6.4					750	1,000	PM C2A
Other							
Procurement							
Total (USMC)	535	415	300	800	750	1,000	

OBJECTIVE:

Demonstrate passive target acquisition for MANPADS with the ability to classify and identify fixed and rotary wing targets for SHORAD firing units.

Enclosure (4)

STATUS:

(1) This TPW applies to the MANPADS task of the ASAD ATD.
(2) Effort builds on a USMC 6.2 task completed at NSWCDD in 4QTRFY92.
(3) Leverages ongoing Army development.
(4) IOC/FOC per Target Acquisition Master Plan.
(5) Responds to deficiencies addressed in MAA 32 (Anti-air Warfare.
(6) This ATD is a synergistic effort with PM C2A and is an enabling component of a larger Air Defense effort.
(7) The $535,000 of 6.2 money is the total FY92 6.2 investment in ASAD.

ISSUES:

None.

PROJECT POC:

LtCol W. Hamm, Marine Corps Systems Command (AWT), 703-784-4790, DSN 278
Mr. T. Saffos, NSWC-DD, 540-653-7361, DSN 249
Maj G. Wilkinson, MARCORSYSCOM (PM C2A), 703-784-2645/2232, DSN 278

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

ADVANCED TECHNOLOGY TRANSITION DEMONSTRATION PROJECT

FOR

FORWARD OBSERVER / FORWARD AIR CONTROLLER SUPPORT TECHNOLOGY

P.E. NO. 63640M

PROJ. NO. CXXXX

23 JULY 90

Submitted:

8/23/90
(signature and date)
Director, AWT

Concur:

M. P. Caulfield. 10/16/90
(signature and date)
Director, WFC, MCCDC

Coordinated:

12 Sept '90
(signature and date)
Program Manager, Ground Weapons

Approved:

R. A. Tiebout 10/24/90
(signature and date)
CG, MCRDAC

AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS
RESEARCH, DEVELOPMENT AND ACQUISITION COMMAND
WASHINGTON, DC 20380-0001

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

FORWARD OBSERVER / FORWARD AIR CONTROLLER (FO/FAC)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

1. PURPOSE/INTENT OF EFFORT.

This ATD will develop and demonstrate a man portable, integrated surveillance, target acquisition, and communication system for use by Marine FOs and FACs.

The effectiveness and survivability of indirect fire weapons and offensive air support (CAS/CIFS) assets depend in large part on timely and accurate targeting information provided by FOs and FACs. The ultimate goal of this effort is to significantly enhance the effectiveness of these supporting arms by providing FOs and FACs with the support equipment needed to effectively carry out their missions.

2. SCOPE OF EFFORT.

This ATD will develop/obtain the software and state of the art hardware needed to demonstrate the subject system under field conditions. Capabilities to be developed and demonstrated include:

a. magnified direct view optics with an add-on night vision device which will provide day/night vision capability.

b. an automated target location determination capability using:

(1) an eye safe laser range finder,
(2) a sensor for determining azimuth,
(3) an inclinometer, and
(4) an algorithm for determining the coordinates of the target.

c. an integrated communications capability for:

(1) communicating with CAS/CIFS assets using the Automated Target Handoff System (ATHS), and

(2) communicating with a Fire Direction Center using Marine Tactical System (MTS) equipment.

The ability of the system to provide the required capabilities in the context of FO and FAC operational environments will be demonstrated in field tests which will include real time interoperation with fire support systems, close air support systems, and close-in fire support systems.

This ATD will build upon the hardware and software developed under the FY86-91 task, "Forward Observer Support Technology."

3. RESOURCE SUMMARY.

($000)	FY90	FY91	FY92	FY93	FY94
6.2	450	247			
6.3a			856	2,350	1,500

4. ATD DELIVERABLES/MILESTONES

a. ATD.

DELIVERABLE/MILESTONE	SCHEDULE
Development Plan	1QTRFY92
Program initiation	1QTRFY92
Award BAA contract	4QTRFY92
Preliminary Design Review	4QTRFY92
Draft System Concept Paper	2QTRFY93
Detailed Developmental (DT-0) and Operationa Test (OT-0) Plan	2QTRFY93
Critical Design Review	3QTRFY93
Test Support Package	4QTRFY93
DT-0	1QTRFY94
Transition of Management to PM Ground Weapons	1QTRFY94
Final System Concept Paper	2QTRFY94
OT-0	3QTRFY94
DT/OT Report	4QTRFY94

b. Other.

DELIVERABLE/MILESTONE	DRAFT	FINAL
Required Operational Capability	3QTRFY92	3QTRFY93
Concept of Employment	2QTRFY93	4QTRFY93
Life Cycle Cost Estimate	2QTRFY93	4QTRFY93
Integrated Logistics Support Plan	3QTRFY93	4QTRFY95
Test and Evaluation Master Plan	4QTRFY93	4QTRFY94
Master Acquisition Plan	4QTRFY93	4QTRFY94

5. PROGRAM REVIEWS.

6. TRANSITION.

7. ENCLOSURES.

Enclosure (1): FO/FAC ATD Goals and Requirements
Enclosure (2): Transition Planning Worksheet (TPW)

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FORWARD OBSERVER / FORWARD AIR CONTROLLER (FO/FAC)

ATD GOALS AND REQUIREMENTS

ATD GOALS	NOTIONAL OPERATIONAL REQUIREMENTS
Demonstrate ability of system to acquire targets (during the day and at night using add-on night vision equipment) in the context of FO and FAC operational environments.	Ability to acquire targets during the day and at night in support of FO and FAC missions.
Automated determination of observer location using an external Global Positioning System receiver.	Automated determination of observer location.
Automated computation of target location.	Automated computation of target location.
Computer aided composition of "typical" call for fire and "typical" FAC brief messages.	Computer aided composition of the full complement of applicable messages.
Automated transmission of "typical" call for fire and "typical" CAS mission messages.	Automated transmissions over fully implemented communication links.
	Ability to support reconnaissance, survey, etc. missions

Enclosure (1)

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TRANSITION PLANNING WORKSHEET

PROGRAM: FORWARD OBSERVER SUPPORT TECHNOLOGY
ORIGINATOR: MARCORSYSCOM (AWT)
TYPE: USMC — ACAT: NON-ACAT
ORIG DATE: _____ — REV DATE: ______

PHASE / MILESTONE	FY90 1 2 3 4	FY91 1 2 3 4	FY92 1 2 3 4	FY93 1 2 3 4	FY94 1 2 3 4	FY95 1 2 3 4	RESP/ REMARKS
6.2 Exploratory Development	---------	---------					AWT
6.3a Advanced Technology Demonstration		---------	--------T	---------			AWT/PM Ground Weapons
Technical Documentation		----	---------	---------			AWT
System Concept Paper		D	F				AWT
Master Acquistion Plan				D	F		PM
Required Operational Capability		D	F				MCCDC
Milestone I				M			PM
Marine Corps Program Decision Meeting (I-II)							PM
6.3b through fielding					---------	---------	PM
IOC/FOC							PM/MCCDC (1)

Legend: (M) - Milestone, (---) - Timeline, (D) - Draft document, (F) - Final document, (T) - Transition to PM

Remarks: (1) IOC/FOC per Target Acquisition Master Plan, (2) Per Target Acquisition Master Plan / ROC

FUNDING ($000)	FY90	FY91	FY92	FY93	FY94	FY95	RESP / REMARKS
6.2	450	107					AWT
6.3a (NON-ACAT)		850	1,950	2,200			AWT
6.3b - 6.4				25*			PM (Minimum PM support)*
Other							PM (2)
Procurement							PM (2)
Total	450	957	1,950	2,225			

Estimated Unit Price: TBD — Estimated Acquisition Objective: TBD

Enclosure (2)

Objective

Demonstrate an integrated, man portable target acquisition and communication system for use by Marine FOs and FACs. Develop hardware/software to automate: determination of observer's position; determination of target location; and, composition and transmission of all for fire and CAS briefs.

Issues

(1) This approach builds upon the technology developed under the ongoing 6.2 program and exploits additional technologies being developed under other programs.

(2) This approach follows the philosophy of involving FMF users as early as possible during the development process.

Status

(1) Brassboard system is being built under the 6.2 effort and will be demonstrated at the end of FY90.

Project Points of Contact

Mr. G. Chambers, Marine Corps Systems Command (AWT), 703-784-4973, DSN 278
Mr. J. Sholander, NSWCDD, 540-653-8493, DSN 249

AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

FORCE XXI LAND WARRIOR (FXXI LW)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

Approval for this ATD project is contained in the Memorandum of Understanding between the Army and the Marine Corps that is on the pages that follow.

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MEMORANDUM OF UNDERSTANDING

Between

MARINE CORPS SYSTEMS COMMAND

and

ARMY SOLDIER SYSTEMS COMMAND

SUBJECT: Force XXI Land Warrior Program

1.0 **Purpose**. The purpose of this Memorandum of Understanding (MOU) is to define the government's organizational structure of the Force XXI Land Warrior program team, to improve the interoperability with the U.S. Marine Corps, and to enhance the accomplishment of assigned mission responsibilities for the Force XXI Land Warrior program. This MOU is intended to delineate the structure and functions of Team Force XXI Land Warrior in order to achieve an optimum Force XXI Land Warrior system that will best meet user needs.

2.0 **Goals**. The goals of this effort are to enhance the success of the Force XXI Land Warrior program in the areas of research, development, and demonstration activities, increase management efficiency and effectiveness, improve customer relationships, and reduce development time and cost. The goals of this MOU will be realized through/by:

2.1 Improved coordination in all aspects of the research and development programs directly related to Force XXI Land Warrior;

2.2 Delineation of Marine Corps funding contributions and functional responsibilities;

2.3 Maximum utilization of the unique technical and/or operational resources peculiar to the Marine Corps;

2.4 Integration / "piggybacking" of testing and other activities, whenever possible, to permit shortened acquisition time and efficient resource utilization;

2.5 Delineation of operating procedures that govern relations among the various organizational elements.

3.0 **Scope**. This MOU applies to efforts associated with research and development in the Force XXI Land Warrior areas assigned to the Marine Corps. This MOU pertains to the administrative and operational relationship between all signing parties needed to effectively coordinate and demonstrate technologies required for the Force XXI Land Warrior program. This memorandum amplifies the interface and the mutual cooperation required among the parties for managing and performing pertinent programs to increase individual survivability, lethality, supportability, sustainability, and combat effectiveness in future warfare environments. Close coordination between science and technology programs, and their associated demonstrations, must be maintained to assure compatibility between technology advancements leading toward a comprehensive system field demonstration in FY98, to facilitate subsequent transition to the Land Warrior Engineering/Manufacturing Development program, and to ultimately field the system in FY00.

4.0 **General Provisions**.

4.1 Every effort will be made to consolidate tasks, especially assessments, demonstrations, and testing. The parties under this memorandum will keep each other abreast of the status of tasks and planned testing and offer others the opportunity to observe or participate in any test, when deemed feasible. It is the responsibility of the Marine Corps Point of Contact (POC) to disseminate testing information all concerned parties.

4.2 The advantage of open exchange of data and information is recognized and every effort will be made to provide all other organizations copies of test data and results, technical reports, program schedules, and funding profiles of those activities that fall under the auspices of this MOU. Due credit must be given to the efforts or support of the other parties. In cases of collaborative efforts resulting in publications with joint authorship, the involved parties agree not to release data and test results without joint clearance. In the case of single authorship involving data derived from a collaborative research effort, no party will release data and results without the consent of the other involved parties. In case of failure to agree as to the manner of publication or interpretation of results, the POCs will be informed, after which either party may publish data after due notice and submission of the manuscript to the other involved parties. In such instances, the party publishing the data will give due credit to the cooperation, but will assume full responsibility for any statements for which there is a difference of opinion. All parties further agree that each will honor technical data restrictions that are contained in contracts or agreements entered into between any other party and its suppliers when advised in writing of such restrictions.

4.3 It is the responsibility of Marine Corps Systems Command to interface with all appropriate parties on the following: draft contract statements of work, test protocols, and statements of work for inter/intra-departmental funding transfers. Representatives from other organizations will be included, as deemed appropriate and by agreement of the Marine Corps POC, on contract proposal review teams whenever the products have a potential organization/Service utility.

4.4 It is the intent of this MOU to assign the Force XXI Land Warrior work to Marine Corps Systems Command with specific (or primary) mission responsibility for the given work effort. By taking advantage of an agency's area(s) of knowledge and expertise, constrained resources are optimized. However, if Marine Corps Systems Command is unable to fulfill its obligations, then an alternate organization may perform the required work at the discretion of the Force XXI Land Warrior Manager and the Secretary of the Army for Research and Development - Technology Transfer (SARD-TT). In such a circumstance, the Marine Corps Systems Command may act as a consultant to the newly assigned agency.

4.5 Because the technologies pertinent to and relevant for application and integration into Force XXI Land Warrior are constantly progressing and evolving as more becomes known within the scientific community, focus and emphasis may shift accordingly (e.g., displays). However, this MOU identifies funding/resource information dedicated to the Force XXI Land Warrior program.

4.6 Funding/resources can only be changed with the approval of the Force XXI Land Warrior Manager and SARD-TT. Requests for changes should be made via the Marine Corps POC and the Marine Corps designated authority in each respective organization to the Force XXI Land Warrior Manager.

5.0 **Responsibilities.**

5.1 The policies and procedures related to Force XXI Land Warrior research and development efforts, and their implementation, are the joint responsibility of the Technical Director (TDs)/Commanders of the organizations listed in Appendix A. These TDs/Commanders will provide adequate technical and administrative manpower/support from their respective organizations to ensure the accomplishment of all cooperative efforts established under this memorandum.

5.2 Direct program oversight for the entire program will be provided by the Force XXI Land Warrior Manager.

5.3 Functional Elements: The operational aspects of this memorandum will be carried out by the designation of Points of Contact (POC) and the formation of Integrated Product Teams (IPTs) and / or Ad Hoc Teams whose formation and responsibilities are defined below. Direct communication among organizations is authorized and encouraged.

5.4 Points of Contact (POC):

5.4.1 Each organization will appoint one individual to serve as the POC. Agencies with a number of activities relating to this MOU are encouraged to designate an alternate POC. Other agencies may designate an alternate POC, if desired. For organizations having more than one contributing program (e.g., Natick, NVESD, etc.), the POC will serve as a "window" to that organization. POCs for each organization are listed in Appendix A.

5.4.2 The POC will serve as a lead liaison manager, overseeing the coordination of and compliance with this MOU. The POC will be responsible for facilitating routine administrative actions; coordinating activities among his/her organization's functional elements; obtaining information from his/her POC counterparts in other organizations regarding the status of efforts for all program activities, contracting/transferring schedules, and documents; facilitating supplements to this MOU, as needed, in cooperation with the affected managers/adminstrators; and, disseminating the information to appropriate individuals within his/her organization. The POC represents the first "level" in conflict resolution where conflict is occurring that cannot be resolved by the individual parties involved.

5.4.3 The POC, in conjunction with the designated authorities, will formally identify technical and operational liaison persons for specific program areas, as required. These persons may:

- Provide continuous technical and operational information exchange;
- Provide interim technical and operational evaluations, as needed and requested;
- Arrange site visits to places where work of mutual interest is being performed;
- Conduct workshops/technical working group meetings to consider technical and/or operational approaches, priorities, and issues;
- Act as IPT chair/leader or participate as a member (IPT is defined above); and,
- Submit a report to the respective POC, if any or all of the above activities are performed.

6.0 **Integrated Product Teams (IPT).**

6.1 For areas of specialized but related interest, an IPT will be established among the appropriate and relevant organizations. The IPT will be chaired by the organization having prime responsibility in the area(s) of interest and will normally include a representative from the Natick Force XXI Land Warrior office. IPT membership will be determined by the Force XXI Land Warrior Manager and IPT chairperson in discussion with the organizations' POCs and will include representation from appropriate organizations. Any member of an IPT, including the POC, will be eligible to chair the team. The Marine Corps will appoint a representative to be a member of the Force XXI Land Warrior Test Management Team.

6.2 The responsibilities of IPTs include: exchange of information relevant to the topic/area(s) of interest; identification of interface problem areas, determining solutions, and making recommendations for resolution through the POC to the designated authority in each respective organization; review of programs to preclude duplication of efforts; and, identification, formulation, refinement, and proposal of programs through appropriate channels. Standing IPTs created by this memo are listed in Appendix B.

6.3 An overall MOU review will be conducted every 12 months as a program review under the auspices of the MOU. The IPTs will meet at least quarterly, or more frequently, as warranted.

6.4 Ad Hoc Team:

6.4.1 An Ad Hoc Team will be established, when required, to address specific problem areas. The Ad Hoc Team will have a narrow focus and its tenure will be of short duration. The teams may complete their tasks by technical information exchanges, meetings or symposia, video teleconference (VTC), teleconference, or the means deemed most effective/appropriate by the chairperson. The team will be disbanded upon completion of its specific assignment.

6.4.2 The Ad Hoc Team will be formed upon the recommendation of the POC and the approval of the designated authority in each respective organization. The team will be chaired by the organization having primary commodity, capability, technology, and/or operational responsibility, as specified in the referenced regulations and plans (to be determined), and as identified in this MOU. Ad Hoc Team membership will be determined by the Force XXI Land Warrior Manager and Ad Hoc Team chairperson.

7.0 **Participating Organizations / General Responsibilities.**

7.1 United States Marine Corps Systems Command, United States Marine Corps.

Provide the POC and resources to staff the IPT.

7.1.2 Resources: see funding in Appendix C.

7.1.3 Deliverables: N/A.

7.2 U.S. Army Soldier Systems Command, Army Natick Research, Development, and Engineering Center, Warrior Systems Office.

Execute the Force XXI Land Warrior program and manage associated funding.

7.2.1 Resources: see funding in Appendix C.

7.2.2 Deliverables: Monthly financial updates to be provided to Marine Corps Systems Command (Code AW).

7.3 Joint Responsibilities.

7.3.1 Each participating organization, through POCs, IPTs, and Ad Hoc Teams, will work jointly on activities leading to the Force XXI Land Warrior final demonstration. At the conclusion of the Force XXI Land Warrior program, all parties will participate, as appropriate, in the production of technical reports, evaluations, etc., as necessary. Paragraphs 7.3.2 through 7.3.8 represent some of the types of activities covered by this MOU.

7.3.2 Provide technical/operational support to Force XXI Land Warrior team members, users, and procurement elements with respect to all matters related to assigned commodity/area(s) of interest.

7.3.3 Conduct cooperative studies and interfaces with other signing organizations to gain fundamental understanding of Force XXI Land Warrior concepts, materials, systems, and procedures.

7.3.4 Provide technical/operational support and, if applicable, samples/materials of assigned commodity area items for timely testing and assessment, consistent with planned Force XXI Land Warrior milestones.

7.3.5 Interface with signing organizations on the testing of materials/items/systems at other government and commercial facilities.

7.3.6 Participate with other signing organizations on the technical characteristics, schedules, funding, operational objectives, and other information related to the Force XXI Land Warrior program.

7.3.7 Participate with the other signing organizations in the functional element activities of this memorandum to formulate, budget, and recommend establishment of programs/efforts, as required.

7.3.8 Each participating organization will cooperate to maintain and make available, on a negotiated or mutually agreed upon priority basis, the necessary facilities, personnel, funding, support, etc., needed to fulfill the objectives of the Force XXI Land Warrior program and this MOU.

8.0 **Reviews**. Reviews will be conducted in concert with the Force XXI Land Warrior In Progress Reviews.

9.0 **Conflict Resolution**. Every attempt will be made to resolve conflicts at the lowest possible level. When conflicts cannot be resolved by the individual parties involved, the conflict will be raised to the next level (and then each subsequent level) until resolution is achieved.

10.0 **Effective Date**. This agreement is effective on the date of the latest signature by the appropriate authority of the respective organizations.

COL Richard Ross
Commander
U.S. Army Soldier Systems Command

MGen Michael J. Williams
Commander
Marine Corps Systems Command

Appendix A - Organizational Data

1. Organization Name.

Soldier Systems Command
U.S. Army Natick Research, Development, and Engineering Center
Warrior Systems Office SSCNC-IW
Kansas Street
Natick, MA 01760

Designated POC:

Mr. Patrick Snow

Central Focal Point:

Mr. John Munroe, comm: 508-233-5813, DSN: 256-5813

2. Organization Name.

United States Marine Corps Systems Command
2033 Barnett Avenue, Suite 315
Quantico, VA 22134-5010

Designated POC and Central Focal Point:

LtCol Eugene Daniels, APM MARINE

USMC Team Members:

Maj Stuart Harris, MCCDC/CWL, DSN 278-5175
Mr. Greg Chambers, MARCORSYSCOM (AW), DSN 278-4973
Capt Jim Budway, MCCDC/Requirements Division, DSN 278-6213

Appendix B - Integrated Product Teams

1. Headgear Technology.

   Bob Whitcraft, Team Leader, Honeywell
   Wayne Antesberger, Army Communications Electronics Command (CECOM)

2. Computer/Radio Technology.

   Dave Gauger, Team Leader, Motorola
   Tim Ryder, CECOM

3. Weapon & Interface Technology.

   Kevin Sherman, Team Leader, Motorola
   Tom Howell, Armaments Research, Development & Engineering Center

4. Protective Technology.

   Linda Pensotti, Team Leader, Arthur D. Little
   Steve Brunette, Natick Research, Development & Engineering Center (NRDEC)

5. Modeling and Simulation.

   Keith Jones, Team Leader, Motorola
   Bob O'Brien, NRDEC

6. MANPRINT.

   Linda McNinch, Team Leader, Motorola
   Cynthia Blackwell, NRDEC

Appendix C - Estimated Funding Required

Force XXI Land Warrior Funding ($M)	FY96	FY97	FY98	FY99	FY00	FY01
63001 DJ50	10	16.2	6.3	7	13.7	
Marine Corps	3.5	2.5	TBD			
Total	13.5	19.7	9.8	7	13.7	

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

ADVANCED LIGHTWEIGHT GROUND WEAPONRY (ALGW)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

Approval for this ATD project is contained in the Memorandum of Understanding between the Army and the Marine Corps that is on the pages that follow.

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MEMORANDUM OF UNDERSTANDING

between

UNITED STATES MARINE CORPS

and

UNITED STATES ARMY

ARMAMENT RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER

JOINT SERVICE SMALL ARMS PROGRAM

on the

OBJECTIVE INDIVIDUAL COMBAT WEAPON

ADVANCED TECHNOLOGY DEMONSTRATION PROGRAM

PURPOSE

To define responsibilities and authorities between the Marine Corps Systems Command (MARCORSYSCOM) and the Joint Service Small Arms Program (JSSAP) Office at the Army Armament Research, Development, and Engineering Center (ARDEC) relative to the Objective Individual Combat Weapon (OICW) Advanced Technology Demonstration (ATD) program. This jointly sponsored program will determine the operational utility, technological maturity and affordability of high-payoff technologies that yield dramatically improved hit probability, lethality, and operational capability in a next generation individual weapon.

SCOPE

The scope of this Memorandum of Understanding (MOU) is limited to the design, fabrication, and test of the OICW culminating in the live fire demonstration of prototype weapons in FY99. The allocation of planned resources is depicted below, subject to the availability of authorized funds and interim technical progress as mutually agreed.

EFFECTIVE DATE

This agreement shall become effective upon approval and signatures of the parties and upon receipt of funding authorization.

REVIEW

This MOU will be reviewed annually to determine the need for additions, changes, or deletions and may be amended at any time upon written agreement between the parties.

DURATION

This MOU will be in effect throughout the term of the JSSAP/Marine Corps OICW ATD program. Each party has the right to terminate its participation in this MOU at any time by providing written notification and justification 90 days prior to the requested termination date.

POINTS OF CONTACT

JSSAP

Commander
U.S. Army Armament Research, Development, and Engineering Center
Attn: Mr. Matthew T. Zimmerman, AMSTA-AR-CCJ
Picatinny Arsenal, NJ 07806-5000

Marine Corps

Commander
Marine Corps Systems Command
Attn: Mr. George Solhan, Code AW
2033 Barnett Avenue, Suite 315
Quantico, VA 22134-5010

ACQUISITION STRATEGY AND POLICIES

The OICW program is formulated from a series of technology base initiatives and Department of Defense (DOD) small arms technology assessments which identified individual combat weapon system data gaps that needed to be filled prior to system development. The identifies data gaps, which formed the basis for the FY92-93 OICW R&D Plan, were in the areas of ranging precision, recoil mitigation, measures of effectiveness definition, miniaturized fire control, and fuzing. The conclusion from the FY92-93 OICW R&D Plan, which included a

comprehensive matrix of the most promising individual combat weapon technologies, projected performance levels, and potential physical characteristics, were the basis for the joint OICW ATD program. The balanced OICW development plan proceeds with mainstream technology thrusts to advance the state-of-the-art and permit continual technology insertion; furthermore, the program instills continuity and focus through a blend of systematic technology base risk reduction initiatives; system development contracts; modeling and simulation (M&S) initiatives; Joint User Advisory Council formation and guidance; and, extremely capable industry teaming arrangements.

The core of the OICW ATD focuses on competitive system development contracts; user-based constructive, virtual, and live fire simulations; and, technology demonstrations. The OICW contracting strategy is based on multi-phased, RDT&E 6.3 OICW system development contracts. The completed Phase I (Jun 94-Dec 94) effort comprised systems analysis and conceptualization activities, constructive modeling and cost versus effectiveness trade-offs, integrated with intensive user feedback. The trade-off analysis included projected unit costs, as a function of performance, for each OICW sub-system. A down selection from three (3) contracting teams to two (2) occurred in February 1995. The two contracting teams are:

1) AAI Corporation (Hunt Valley, MD) - Prime Contractor
   - Hughes Aircraft
   - Dyna East
   - Fabrique Nationale
   - Olin

2) Alliant Techsystems (Hopkins, MN) - Prime Contractor
   - Contraves
   - Heckler & Koch

Phase II (Jan 95-Jan 96) was the critical sub-system component design phase requiring detailed design and demonstration of system-critical component technologies, as identified in Phase I (e.g., fuze, laser, processing algorithms, packaging). The collected laboratory test data was used to validate and update constructive modeling activities and was used to refine the OICW System/Segment Specification. Phase II also included complete contractor/Government Integrated Product and Process Development (IPPD) training, implementation, and interfacing with the Force XXI Land Warrior contractor and team.

Following successful Phase II demonstrations by both contractors, it was determined to continue with both contractors into Phase III. The technologies represented by both contractors are sufficiently different to justify the further investigation of both approaches. The Army has increased the program funding to allow for this additional activity. Both contractors in Phase III begin prototype system design, integration, and demonstration activity. A contractor demonstration will occur at the end of Phase III to validate the preliminary OICW System/Segment Specification, obtain ballistic test data for input to constructive modeling and establish the OICW proof-of-concept. The Phase III prototype system design, integration, and demonstration activity includes delivery of a functional, but non-firing, OICW mock-up to support man-in-the-loop virtual simulation exercises. The OICW mock-ups will permit the

honing of system ergonomics and performance prior to fabricating operational test hardware. The use of a virtual simulator will be instrumental in streamlining the physical and functional characteristics of OICW systems, while addressing soldier/Marine interface concerns early in the ATD program.

Following the demonstration and evaluation of a complete prototype system by both contractors, a single concept will be selected for Phase IV (Sep 97-sep 98), OICW final system design, and hardware build activity. Six (6) OICW systems and associated ammunition will be fabricated to support Force XXI Land Warrior tests in FY98. These tests will also assess the interface performance of the OICW fire control on current weapon systems. Phase IV will include OICW system safety tests at the Aberdeen Test Center to support a Test and Evaluation Command (TECOM) safety release allowing soldiers and Marines to live fire the weapons in the FY99 OICW ATD/Dismounted Battlelab Experiment (DBE).

An OICW DBE will be designed based on an equipped dismounted infantry squad to assess soldier/Marine lethality, performance, and utility. Situational, live fire training exercises using scenarios developed by the DBBL, and approved by the Director of Combat Development and Director of the Commandant of the Marine Corps' Warfighting Lab (CWL) MCCDC, will be utilized in the evaluation. These exercises will also validate the OICW's virtual simulation results for future analytical use, thus permitting management to ascertain the readiness of the OICW system for development. Upon mutual agreement on completion of the ATD, management of the program will transition to a Joint Service Program Manager (PM). The OICW ATD has been further documented in the OICW ATD Plan jointly approved by the Army and the Marine Corps.

MANAGEMENT

The OICW ATD is a joint Army/Marine Corps program with the Army as the lead Service, managed by the U.S. Army ARDEC, JSSAP Office. The JSSAP PM is responsible to the JSSAP Management Committee and to the MARCORSYSCOM. Any program issues not resolvable by the PM, will be resolved between the JSSAP Management Committee and appropriate level individuals from MARCORSYSCOM.

An IPPD management framework is established, creating a consortium of users, industry, and material developers for integrating product development with product manufacturing processes. This IPPD management approach will optimize the OICW system via product and process trade-offs, in addition to providing the highest degree of quality in the shortest amount of time and cost.

SECURITY

Security oversight of the program will be administered by the JSSAP in accordance with the OICW Security Classification Guide dated 31 Jan 1994.

RESPONSIBILITIES AND DELIVERABLES

MARCORSYSCOM

a. Participate in Integrated Product Teams (IPTs), Management Team, Joint User Advisory Team, Downselect Committee, and all Reviews and Assessments.

b. Provide funding in accordance with paragraph 11.

c. Coordinate the involvement of the MCCDC and the CWL in the development process and assessments.

d. Coordinate USMC participation in the user assessments, evaluations, and DBEs.

JSSAP/ARDEC

a. Manage overall program to cost, schedule, and performance.

b. Plan and execute all demonstrations and assessments.

c. Chair or facilitate all IPTs, Management Teams, and the Joint User Advisory Team.

d. Meet fiscal obligation and disbursement goals.

e. Ensure availability of prototype OICW systems for Service specific Marine Corps warfighting experiments at the completion of the DBE.

Deliverables.

a. Nine (9) OICW systems in accordance with paragraph 9 of this document.

b. Test data and reports.

c. Monthly obligation and disbursement reports.

d. System/Segment Specification.

e. System Concept Plan (Concept of Operation).

f. Coordinated Test Plan.

g. Simulation and Modeling Plan.

h. Logistics Support Plan.

i. Transition Plan.

j. Reliability Program Plan.

k. Training Plan.

PLANNED FUNDING

In view of funding from the JSSAP, supplemental funding is provided by MARCORSYSCOM to the extent shown in the chart below.

($000)	FY95	FY96	FY97	FY98	FY99
JSSAP D627/AH21	7,803	4,070	4,500	3,352	3,010
USMC		500	1,100	1,200	600
Army Plus Up		750	3,000	2,000	1,000
Subtotals:	7,803	5,320	8,600	6,552	4,610

All cost estimates are based on engineering cost estimates and initial contract cost proposals. As the OICW concept design is matured, these costs may change. Requirements for additional funding will be negotiated between the parties. Moneys resulting from under-runs will be returned.

Matt Zimmerman
OICW ATD Manager
JSSAP

George Solhan
ACTD/ATD Manager, AWT
MARCORSYSCOM

CG
ARDEC

Commander
MARCORSYSCOM

NON-ACQUISITION CATEGORY (NON-ACAT)
PROGRAM DEFINITION DOCUMENT (NAPDD)

ADVANCED TECHNOLOGY DEMONSTRATION
FOR
ADVANCED AMPHIBIOUS LOGISTICS/COMBAT SERVICE SUPPORT

NAPDD NO. 95-1

PE 060364M PROJECT C2223

SUBMITTED:

Director, AWT, MARCORSYSCOM — 29 JAN 96 Date

ENDORSED:

Deputy CG, MCCDC — 23 Feb 96 Date

APPROVED:

Commander, MARCORSYSCOM
Acting — 21 Mar 96 Date

TASKING:

MARCORSYSCOM
ASSIGNED SYSCOM — 22 MAR 96 Date

ASN(RD&A), DEPUTY FOR EFP

AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VA 22314-5010

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

ADVANCED AMPHIBIOUS LOGISTICS COMBAT SERVICE SUPPORT (AAL/CSS)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

Purpose/Intent Of Effort

The emerging Operational Maneuver From the Sea (OMFTS) concept suggests that future Marine Corps amphibious operations will be launched from a sea-base located some distance over the horizon through critical vulnerabilities to attack the enemy center of gravity. The purpose of the AAL/CSS Advanced Technology Demonstration (ATD) is to demonstrate technology applicable to providing CSS for OMFTS. Additionally, these technologies must be able to significantly enhance the CSS capabilities for traditional amphibious assault and Maritime Prepositioning Force (MPF) operations. The primary focus of the AAL/CSS ATD will be on materiel concept technical, integration, and transition risk reduction. A systems approach to ATD structure will incorporate maturing technologies to enhance all functional areas of CSS. Successfully demonstrated technologies will transition to the Demonstration and Validation (DEMVAL) phase of the acquisition cycle. A more flexible, versatile, and responsive CSS system is the primary goal of the ATD.

Background. Modern military operations require lethal firepower, mobility, survivability, and versatility at all levels of conflict and in all environments. While tilt rotor and Advanced Amphibious Assault Vehicle (AAAV) technology will enhance the assault capabilities of the Marine Corps in terms of increased speed and range of maneuver forces, the current CSS capabilities can only provide the dependable and seamless support envisioned for OMFTS in a very limited sense. The Amphibious Warfare Technology (AWT) Directorate of MARCORSYSCOM is conducting a continuing Applied Research (6.2) program to address CSS capability shortfalls for OMFTS. Many of the projected CSS shortfalls were identified following Desert Shield/Storm through comprehensive study of lessons learned and evaluation of existing CSS capabilities. The objective of the 6.2 project is to address these shortfalls through technology development in areas most critical to improved capability. The scope and vision of the 6.2 developmental program will continue to focus on CSS capability voids envisioned under the operational tenets of OMFTS. Certain elements of this project will be ready for transition to 6.3 beginning in FY96. One focus of this ATD will be to incorporate emerging technologies to enhance traditional capabilities and enable effective Logistics/CSS of OMFTS.

System Requirements and Concepts Description. Key operational goals of OMFTS are to avoid crossing the beach in the traditional amphibious landing mode and to significantly reduce footprint ashore. These goals drive toward sea-basing the majority of CSS, Command and Control (C2), and Fire Support functions. A sea-based CSS system must be capable of providing adequately responsive and reliable CSS under all envisioned operational scenarios. CSS functions must be expeditionary and focused on point-to-point delivery to the greatest possible extent. The CSS system must support inland operations of multiple, highly maneuverable elements engaged in very fluid, high paced operations. To be effective, key CSS technologies must function together to form a systems capability that can solve the time, distance, weight, and cube challenges posed by OMFTS.

Scope Of Effort

To achieve this concept in the mid-far term, this ATD will develop, integrate, and demonstrate major on-going technical efforts, including: (1) Recording and Tracking Technologies (RTT); (2) Expeditionary Bulk Liquid Technologies (EBLT); (3) Expeditionary Cargo Packaging Technologies (ECPT); and, (4) Expeditionary Engineering Technologies (EET). These technology areas were developed to resolve CSS deficiencies identified in the study which initiated the Advanced Expeditionary Combat Service Support (AECSS) 6.2 project. The ATD will incorporate developmental technologies from these areas which have shown strong field application potential, as well as incorporate new-start 6.2 efforts in such areas as Expeditionary Maintenance Technologies (EMT) and Expeditionary Transportation Technologies (ETT). The initial technology focus of this ATD will be the demonstration of RTT.

RTT, the most mature AECSS technology, can provide the capability to autonomously locate and manifest supplies and equipment. When integrated with existing or projected C2 and Logistics Automated Information Systems (LOGAIS), RTT can facilitate a more responsive "pull" supply system. Other technologies from the AECSS project, such as those listed above, will be incorporated in this ATD as they emerge and mature. A robust AAL/CSS ATD will show bulk liquid distribution through innovative unit level packaging and remote sensor monitoring of fuel consumption using RTT, EBLT, EMT, and ECPT. Receipt and distribution of these packages may be demonstrated by technology developments emerging from the ECPT and EET efforts.

System Concept Development. Operational and technical modeling will be used to gauge technical capabilities of all proposed AAL/CSS ATD systems or subsystems. This will aid in the selection of technologies to be incorporated and ensure all ATD components support the system goal of improved CSS capability.

System Design and Fabrication. The selected system/sub-system concepts will be designed, fabricated, and integrated into a flexible AAL/CSS system. A demonstration model will be fabricated and extensive component and sub-system test and evaluation will be done. Modeling and simulation will be heavily employed in support of both design and evaluation.

Platform Integration. System components will be integrated on the demonstration platform and verified for functionality. Initial system technical evaluation will be conducted.

Test and Evaluation. The system and sub-systems will undergo formal developmental testing consistent with the developmental phase of the program. Modeling and simulation will be employed to the greatest extent possible.

Demonstration. Testing will demonstrate the capabilities to user organizations and allow user to provide needed feedback to aide in further development of technology, applications principles, and operational doctrine.

Goals And Requirements.

The operational tenets or characteristics of OMFTS will undoubtedly prescribe the development of new CSS systems which can provide CSS capabilities in the challenging, new operational environment. Enclosure (1) identifies general goals for this ATD and associates them with perceived OMFTS CSS capability requirements. Specific technical goals for the FY96 start of RTT in the ATD have been drafted and will be incorporated in the RTT ATD management plan. The general ATD goals and requirements provide the impetus for developing AECSS 6.2 technologies which will be matured for the AAL/CSS ATD. As technologies successfully demonstrate the ability to meet ATD goals, they will transition to appropriate Program Managers. As additional 6.2 technologies addressing other ATD goals and requirements mature, they will be incorporated into the ATD with separate technical goals and milestones.

AAL/CSS ATD Transition Planning Work Sheets.

Enclosure (2) outlines key planning information related to the 6.2 AECSS/6.3 AAL/CSS projects. This includes short range and long range planning data and the funding lines that support the project. These work sheets function as planning and execution tools for the ATD process, as outlined in paragraph 3 above and enclosure (1). They reflect out-year planning in anticipation of technology transition from the 6.2 AECSS program into the AAL/CSS ATD and subsequent transition to a Program Manager. Accordingly, annual NAPDD updates will reflect changes in the AAL/CSS ATD transition planning work sheets.

Enclosures

Enclosure (1): AAL/CSS ATD Goals and Requirements
Enclosure (2): Transition Planning Worksheet

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ADVANCED AMPHIBIOUS LOGISTICS COMBAT SERVICE SUPPORT (AAL/CSS)

ATD GOALS AND REQUIREMENTS

ATD GOALS	NOTIONAL OPERATIONAL REQUIREMENTS
Demonstrate in-the-box and in-transit accountability of designated CSS assets	Autonomous manifesting of supplies and equipment. Geo-location of designated assets, linked with C2 system.
Demonstrate breakdown packaging for forward liquid distribution. Show minimal Material Handling Equipment (MHE) necessity. Demonstrate rapid refill of bulk distribution containers at ship supply source.	Bulk liquid packaging to support forward maneuver distribution where there is minimal MHE.
Landing Zone Support Activity (LZSA) construction to support CSS responsiveness throughout to the maneuver element. Ability to handle a variety of load packages in the LZSA with reduced manpower.	Air-liftable expeditionary material handling equipment. LZSA rapid preparation for CSS receipt. Timely CSS distribution support.
Demonstrate unit load packaging on a deployable modular suiting packaging facility operation.	Seabasing of CSS; rapid incremental movement of CSS ashore; and, rapid retrograde of CSS to seabase for follow-on missions.
Demonstrate deployable maintenance, including self-diagnostics and integrated on-line operator support. Preventive maintenance in the field including automated user hour log.	Self-diagnostics of equipment, including connectivity to logistics support. Autonomous field-determination of repair necessary equipment.

Enclosure (1)

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TRANSITION PLANNING WORKSHEET

PROGRAM: ADVANCED AMPHIBIOUS LOGISTICS COMBAT SERVICE SUPPORT (AAL/CSS) - RECORDING AND TRACKING TECHNOLOGIES
ORIGINATOR: MARCORSYSCOM (AWT)
TYPE: USMC   ACAT: NON-ACAT
ORIG DATE: 28 AUG 95   REV DATE: ______

PHASE / MILESTONE	FY96 1 2 3 4	FY97 1 2 3 4	FY98 1 2 3 4	FY99 1 2 3 4	FY00 1 2 3 4	FY01 1 2 3 4	RESP/ REMARKS
6.3a Advanced Technology Demonstration							AWT
Technical Documentation							NFESC
Mission Need Statement	D F						MCCDC
Integrated Program Summary		D F					AWT/PM C4I
Cost and Operational Effectiveness Analysis		D F					MCCDC
Operational Requirement Document		D	F				MCCDC
Marine Corps Program Decision Meeting (0, I)		M	M				AWT/PM C4I
6.4 through Fielding							PM C4I

Legend: (M) - Milestone, (---) - Timeline, (D) - Draft document, (F) - Final document, (T) - transfer to PM

FUNDING ($000)	FY96	FY97	FY98	FY99	FY00	FY01	RESP / REMARKS
6.3a (Non-ACAT)	966	2,000					AWT
6.4							PM C4I
Other							
Procurement							
Total (USMC)	966	2,000					

Objective

Develop and demonstrate the capabilities of radio frequency tags to provide autonomous tracking and manifesting information integrated into existing and emerging C4I systems.

Enclosure (2)

Status

Project is currently in third year of 6.2 effort.

Issues

POM 98 initiative number 80-14 submitted for 6.4 funding.

Project Points of Contact

Maj T. Manley, Marine Corps Systems Command (AWT), 703-784-4788, DSN 278
Mr. Shujie Chang, Naval Facilities Engineering Services Center, 301-227-2965

Enclosure (2)

NON-ACQUISITION CATEGORY (NON-ACAT)
PROGRAM DEFINITION DOCUMENT (NAPDD)

**ADVANCED TECHNOLOGY DEMONSTRATION
FOR
JOINT TACTICAL COMMUNICATIONS (JTC)**

NAPDD NO. ________

PE 0603640M **Project C2081**

SUBMITTED:

Director, AWT, MARCORSYSCOM 28 APR 95
Date

REVIEWED:

F.S. , Deputy Director
Director, Requirements Division, MCCDC 16 MAY 95
Date

APPROVED:

Commander, MARCORSYSCOM 16 Aug 95
Date

TASKING:

MARCORSYSCOM
ASSIGNED SYSCOM

Date

ASN (RD&A), DEPUTY FOR EFP

AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VA. 22314-5010

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

JOINT TACTICAL COMMUNICATIONS (JTC)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

Purpose/Intent of Effort

To develop and demonstrate the capabilities of a Joint Army/Marine Corps modular, radio frequency (RF) transceiver using ultra-wide band (UWB) digital impulse technology. UWB technology has demonstrated unique RF properties which support both high data rate transmission and clandestine (low probability of intercept/detection (LPI/LPD)) operations.

Background. Battlefield communication, especially that required to support special operations or tactical units close to the forward edge of the battle area (FEBA), poses a special challenge to ensure unit and system survivability in a clandestine and/or command and control warfare (C2W) intense environment. A communication capability is required which will permit freedom of operation, in a command, control, and communication (C3) sense, to enhance mission accomplishment and minimize friendly force detection via enemy C2W.

A UWB communication capability will be developed to support a wide variety of battlefield communication requirements. These requirements, which can be found in a variety of mission area analysis (MAA) documents, mission need statements (MNS) and operational requirements documents (ORD) show that many battlefield functions recognize the need for clandestine, secure, robust, and, sometimes, wide bandwidth communication.

The capabilities envisioned through the development of this technology appear to hold promise in supporting other Advanced Technology Demonstration programs such as Force XXI Land Warrior (FXXI LW), DARPA/CECOM's Commercial Communication Technology Testbed (C2T2), Army/CECOM's Digital Battlefield Communications (DBC) ATD, as well as the Army's effort for Digitization of the Battlefield.

System Requirements and Concept Description. A tactical communication system is required which will provide clandestine communications, perform multiple communication functions with a single device (thus meeting multiple requirements), and transmit data at rates far exceeding currently fielded man-portable systems.

Two basic designs are proposed; one design will support low data rate functions (e.g., voice and beaconing), while the second design will support higher data rate functions (e.g., data and imagery transfer).

It is intended to consolidate as many functions into one unit as feasible, and to modularize the design to support enhanced operational and logistical requirements. All of these functions will be supported via a radio frequency signal which is extremely LPI/LPD in accordance with Enclosure (1). The systems should also incorporate design features that are inherently resistant to electronic jamming techniques.

Scope of Effort

It is intended to design, build, and demonstrate two basic devices to support a number of capabilities. A low data rate (LDR) device that will: (1) provide a small size voice radio for company communication, that could be switch selected to an intraforce (outside company) line of sight (LOS) communicator; (2) provide combat identification (ID); (3) perform beaconing for extraction/location or follow-the-leader in low visibility situations; and, (4) act as a tracking device. A goal will be to design and build the LDR so that two of these four functions can be executed simultaneously, i.e., voice and beaconing, or voice and combat ID.

A high data rate (HDR) device that will: (1) provide a wireless local area network (LAN) capability for any command post (CP) that would allow multiple simultaneous LANs within a CP and gateways between LANs; (2) exhibit the ability to multiplex (MUX) together the single channel radio (SCR) data and voice circuits and transmit/receive them to/from the antenna farm; (3) handle the transfer of imagery data from remote sensors; and, (4) extend the operational distances of the above functions via a retransmission mode. A goal will be to design and build the HDR so that any of the four functions are switch selectable from a single device.

This effort will be conducted using two demonstration periods, as depicted in enclosure (2), each using fieldable prototype models produced to meet the ATD goals as depicted in enclosure (1). The first demonstration will involve the LDR device. This will be done for two reasons. First, the LDR device is closest in design to the developer's current brass board system and will require fewer modifications. Second, this will permit operational users to get the device in their hands for evaluation and feedback. With this knowledge, the developer will be able to not only enhance the LDR device design (if necessary), it will also assist in the design and development the more sophisticated HDR device.

The second demonstration will involve the HDR device, and if necessary, the LDR device. The higher data transmission rate, longer operating ranges, and necessary integration with other communication devices will require a longer design and build time for the HDR device.

Operational testing is scheduled during the final year of the ATD. At the end of the ATD, the technology used to produce the LDR and HDR devices will be available for transition to an acquisition program under the appropriate Program Manager.

Resource Summary

RDT&E,N ATD funding profile.

($000)	FY95	FY96	FY97	FY98	FY99	FY00	FY01
6.3	250	461	1,938	2,001			
6.4					1,095	995	1,989

Deliverables/Milestones

ATD.

LDR DEVICE DELIVERABLE/MILESTONE	SCHEDULE
Program Initiation	1QTRFY95
System Requirements Review	3QTRFY95
System/Segment Specifications	4QTRFY95
In Progress Reviews	Triannually
System/Segment Design Document	1QTRFY96
Critical Design Review	2QTRFY96
Detailed Test Plan	4QTRFY96
Test Readiness Review	4QTRFY96
Mission Need Statement	4QTRFY96
Developmental Test (DT-0)	1QTRFY97
Operational Requirement Document	1QTRFY98
Operational Test (OT-0)	4QTRFY98
System Final Designs	4QTRFY98

HDR DEVICE DELIVERABLE/MILESTONE	SCHEDULE
Program Initiation	1QTRFY95
System Requirements Review	3QTRFY95
System/Segment Specifications	1QTRFY96
In Progress Reviews	Triannual
System/Segment Design Document	3QTRFY96
Critical Design Review	3QTRFY96
Detailed Test Plan	1QTRFY97
Test Readiness Review	1QTRFY97
Mission Need Statement	4QTRFY96
Developmental Test (DT-0)	4QTRFY97
Operational Requirement Document	1QTRFY98
Operational Test (OT-0)	4QTRFY98
System Final Designs	4QTRFY98

Other.

DELIVERABLE/MILESTONE	SCHEDULE
Memorandum of Agreement (Army/Marine)	4QTRFY95
Transition Documentation (as required)	4QTRFY98
Milestone I	1QTRFY99

Program Reviews

Both event driven and regularly scheduled reviews will be conducted. The Director, AWT will conduct In Progress Reviews (IPRs) triannually, beginning four months after project initiation. Event driven reviews, such as Critical Design Reviews, will precede major technical and program decision points and may supplement or supersede the triannual IPR schedule. Project progress will be briefed and a written report submitted by the Technical Development Activity (TDA) at all reviews. Project financial status reports will be provided to the Director, AWT on a monthly basis.

Transition

This ATD will develop a number of capabilities that are currently at different stages of engineering maturity. For this reason, it is anticipated that some capabilities could possibly transition sooner than others.

Emphasis will be placed on "plug and play" compatibility of developmental systems with currently fielded systems to streamline the transition process, and prove the systems readiness for transition during the formal demonstrations. In support of the Marine Corps System Command's philosophy of a streamlined and evolutionary acquisition life cycle, and to accelerate the fielding of this technology via an acquisition program, it is recommended that a milestone (MS) I/II decision be made in FY99, and a MS III decision be made in FY01. In support of this goal, the Director, AWT, will submit a Program Objective Memorandum (POM)-98 initiative for FY01 Procurement Marine Corps (PMC) funds.

In an effort to further support the transition of these capabilities into an acquisition program, the Director, AWT will release a Broad Agency Announcement (BAA) in FY98 requesting proposals for other technologies which may have been developed in the intervening years. This information will enable a more accurate and prudent MS I/II decision.

Enclosures

Enclosure (1):	ATD Goals and Requirements
Enclosure (2):	Transition Planning Worksheet (TPW)

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JOINT TACTICAL COMMUNICATIONS

ATD GOALS AND NOTIONAL REQUIREMENTS

		ATD GOAL		
FUNCTION	DATA RATE (kbps)	DISTANCE* (km)	DETECTABLE RANGE (m)	DATA RATE (kbps)
LOW DATA RATE DEVICE				
VOICE RADIO				
COMPANY	30	1	30	30
INTRAFORCE	30	15	300	30
COMBAT ID	30	1	30	30
BEACON	30	15	300	30
TRACKING	30	15	200	30
HIGH DATA RATE DEVICE				
WIRELESS LAN	1,544	1	200	10,000
ANTENNA FIELD REMOTE	1,544	1.5	200	10,000
IMAGERY TRANSFER	1,544	10	300	10,000
RELAY	1,544	50	300	10,000

* Distances assume unobstructed radio line of sight.

Enclosure (1)

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TRANSITION PLANNING WORKSHEET

PROGRAM: JOINT TACTICAL COMMUNICATIONS
ORIGINATOR: MARCORSYSCOM (AWT)
TYPE: JOINT SERVICE
ACAT: NON-ACAT
ORIG DATE: 10 FEB 95
REV DATE: ______

MILESTONES	FY94 1234	FY95 1234	FY96 1234	FY97 1234	FY98 1234	FY99 1234	FY00 1234	FY01 1234	Responsibility
6.2 Exploratory Development	------								AWT/CECOM
6.3 Advanced Technology Demo		------	------	------	------				AWT/CECOM
LDR DT-0				M					AWT/CECOM
HDR DT-0				M					AWT/CECOM
LDR and HDR OT-0					M				AWT/CECOM
Technical Documentation		------	------	------	------				AWT/CECOM
Mission Need Statement			D F						MCCDC
Operational Requirement Document				D	F				MCCDC
MCPDM						I/II	III		PM COMM
Transition through 6.4						T----	------	------	PM USA/USMC
IOC/FOC (TBD)									PM COMM

Legend: (M) - Milestone, (---) - Timeline, (D) - Draft document, (F) - Final document, (T) - Transition to PM

FUNDING ($000)	FY94 1234	FY95 1234	FY96 1234	FY97 1234	FY98 1234	FY99 1234	FY00 1234	FY01 1234	Responsibility
6.2	650								AWT/CECOM
6.3		250	461	1,938	2,001				AWT/CECOM
6.4						1,095	995	1,989	AWT/PM COMM
TOTAL	650	250	461	1,938	2,001	1,095	995	1,989	

Estimated Unit Price: TBD

Estimated Acquisition Objective: TBD

Enclosure (2)

Objective

To develop and demonstrate low to high data throughput, digital communication devices that are LPI/LPD and Anti-Jam (AJ) to support the emerging requirements for battlefield Command, Control, Computer, Communication and Intelligence (C4I). Eliminate the need for laying wire throughout the CP and to the antenna field. These capabilities will vastly increase communications, enhance mobility, and increase personnel and system survivability.

Issues

None.

Status

Independent demonstration of UWB, digital impulse radio transceiver at NSWCDD on 3 Aug 1994. USA CECOM RDEC 6.3 Survivable Adaptive Systems (SAS) ATD is ongoing.

Program Points of Contact

Maj T. Manley, MARCORSYSCOM (AWT), 703-784-4788, DSN 278
Mr. J. Inserra, CECOM, 908-427-4107, DSN 996

NON-ACQUISITION CATEGORY (NON-ACAT)
PROGRAM DEFINITION DOCUMENT (NAPDD)

ADVANCED TECHNOLOGY DEMONSTRATION (ATD) FOR INTEGRATED COMBAT OPERATIONS CENTER (ICOC)

NAPDD NO. 95-2

PE 0603640M

PROJECT C2223

SUBMITTED:

Director, AWT, MARCORSYSCOM

17 Apr 96
Date

ENDORSED:

Paul K. Van Riper
CG, MCCDC

29 April 96
Date

APPROVED:

Commander, MARCORSYSCOM

16 May 96
Date

TASKING:

MARCORSYSCOM
ASSIGNED SYSCOM

28 MAY 96
Date

ASN(RD&A), DEPUTY FOR EFP

AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VA 22314-5010

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

INTEGRATED COMBAT OPERATIONS CENTER (ICOC)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

Purpose/Intent of Effort

The Integrated Combat Operations Center (ICOC) Advanced Technology Demonstration (ATD) Program will demonstrate a USMC Combat Operations Center (COC) concept that promotes rapid and intuitive decision making based on an experienced and analytical knowledge base in a flexible and professionally engineered sheltered system. The ICOC ATD will emphasize technology development and demonstrations to solicit direct user feedback and mature supporting operational concepts. The program is jointly funded by the USMC and USN for the purpose of providing echelon scaleable COC concepts for both. ICOC ATD will focus technology development and system analysis on enhancing Situation Awareness (SA) through improved visualization and flexible intuitive decision making processes applicable to Battalion through Marine Expeditionary Force (MEF) command levels. The program will share technology development with US Navy, Army, and DARPA programs.

Background. Two key issues for effective Command and Control on the future USMC battlefield are how to increase operational tempo in an uncertain environment while, at the same time, improving unity of action and purpose. For command effectiveness we must operate faster and more effectively than the enemy in Observation-Orientation-Decision-Action processes (OODA Loop). On the future dispersed and uncertain battlefield, commanders intent must be well understood at all levels to promote individual initiative and unity of action. In the past, the USMC has taught command decision making with plan generation, dependent on the output of a fifteen step analytical process. The analytical command and staff process generates several courses of action (COAs), identifies criteria for evaluating COAs, rates each COA according to the criteria, and tabulates the score to imply the best COA. This analytical process is methodical, complex, and time consuming. Intuitive decision making relies on a commander and his staff having experience and inherent judgment to recognize the key elements of a particular problem and arrive at the proper decision. The key to intuitive decision making is to provide information to the commander and his staff through knowledge based images and collaboration, vice inundation with raw data. Future command and control processes need to allow the commander (and staff) to focus on the pertinent part of the "perception map". Command and control processes need to sort, integrate, and present information in a way that conveys knowledge most

efficiently and effectively. Processes need to permit queries and other interactions that are suited to the way a commander approaches problem solving.

System Requirements and Concept Description. The physical layout of future USMC COCs need to be flexible and support operations under a variety of situations and organizational constructs. On the modern, fast moving, complex, and information intensive battlefield, a commander must be able to: assimilate tactical situation information rapidly; develop a clear understanding and awareness of the battlespace; make rapid and accurate decisions; and, establish/displace his command post on short notice during all phases of an operation. These concept notions mandate an intelligent, systematic approach to the design of COCs and necessitate professionally engineered facilities which are automated, integrated, flexible, and mobile. ICOC ATD Goals and Notional Requirements are provided in Enclosure (1).

Scope of Effort

The ATD will develop and successfully demonstrate the software and state-of-the-art hardware needed to construct an advanced, systems integrated, COC. The concepts demonstrated by the ICOC will be scaleable, in part, over the MEF to Marine Expeditionary Unit (MEU) and Division to Battalion command levels. The effort will be a phased approach through the years 1996 - 2001 with demonstration of incremental builds on a yearly basis. The development of the ICOC ATD falls into two basic areas: mental and physical. The mental development area, is based on intuitive decision making focusing on the commander, how he makes decisions, and what he needs to know to expedite decision making. Development focus on intuitive decision does not preclude the need for rigorous and detailed mental analysis in support of decision making. Both mental processes (intuitive and analytical) must be available and supported by the ICOC for use by both the commander and his staff, as the situation dictates. The second development area, physical, is focused on tangible elements of the COC proper: systems, shelters, organization, and human interaction. Demonstrations during the first two years will focus on advanced visualization with knowledge-based displays that promote intuitive decision making. The demonstrations will be conducted with the view of compliance to an evolving Global Command and Control System (GCCS). As human factors engineering criteria evolve, focus will shift to addressing system integration of the COC into vehicles and shelters for field demonstrations and operational testing. Demonstrations conducted during and after the third year will use the Marine Common Hardware Suite and the GCCS Common Operating Environment for basic services, or will use hardware or system software which can reasonable be expected to upgrade these products.

Enabling Technologies

A number of enabling technologies will be used in this ATD. These technologies include cognitive science, intelligent agents, digital communications, embedded training, modeling and simulation, advanced display hardware, advanced computers and software, multi-functional

systems, ergonomics, advanced human/computer interface, and multimedia. Use of several of these technologies is discussed below.

Cognitive Task Analysis and Visualization. Cognitive task analysis (CTA) will be utilized to determine the command and control decision making process and the related information usage requirements of the users. The CTA results will be used to develop knowledge based information displays for readily conveying the battlespace content to the commander and staff. The knowledge based information displays will allow increased operational tempo through reduction of Observe, Orient, Decide, and Act (OODA) process loops of the commander and staff, so as to assure decisions are made and action taken quicker than the enemy.

Intelligent Agent Integration. Intelligent agents will be integrated into the prototype baseline in order to prioritize, fuse, and validate information for the commander and his staff. These software modules will perform constraint checking of operations and plans, supply push on critical information items, and conduct autonomous searches for requested data in a networked, heterogeneous database environment.

Digital Communications. Advances in digital communications and the leveraging of that technology from Army (Digitization Of The Battlefield), DARPA (Battlefield Awareness And Data Dissemination), and Marine Corps (Joint Tactical Communications ATD) programs will provide greater and more secure connectivity to the ICOC. Digital communication advancements will also allow components of the ICOC to be untethered, allowing more rapid deployment and employment of maneuver elements.

Modeling and Simulation. The technology advances in modeling and simulation software and architecture will allow Marines in the ICOC to perform: system and subsystem functional modeling, course of action analysis, and embedded training and education. The ICOC ATD will draw upon the large base of modeling and simulation software presently under development by the Marine Corps (Leathernet, Marine Tactical Warfare Simulator (MTWS),...), Defense Modeling and Simulation Office (DMSO) (COMPASS), Army (Battlefield Planning and Visualization,...), and other organizations.

Resource Summary

The funds required to execute the ICOC ATD are listed as follows:

($000)	FY95	FY96	FY97	FY98	FY99	FY00	FY01
Marine Corps (6.3)		1,000	2,000	2,990	3,096	3,377	3,390
Marine Corps (6.4)							
Office of Naval Research (ONR) (6.2)	500	500	500				
ONR (6.3)							

ATD Milestones/Deliverables

Milestones.

MILESTONE	SCHEDULE
Program Initiation	1QTRFY96
Technology Support Plan	1QTRFY96
In Progress Review	semi-annual
Situation Awareness Display Demo	4QTRFY96
Technology Support Plan	1QTRFY97
Commanders Display Demo	2QTRFY97
Joint Warrior Interoperability Demonstration (JWID) Test Plan	2QTRFY97
JWID 97 Demonstration (decision and execution process multimedia displays)	4QTRFY97
Technology Support Plan	1QTRFY98
Field Demonstration (modeling and simulation, personnel requirements, planning tools, information management tools)	4QTRFY98
Technology Support Plan	1QTRFY99
Developmental Test (DT-0) Test Plan	2QTRFY99
DT-0 (interoperability, scalability, mobility)	4QTRFY99
Technology Support Plan	1QTRFY00
Early Operational Assessment (EOA)/Operational Test (OT-0) Test Plan	1QTRFY01
EOA/OT-0	3QTRFY01

Deliverables.

DELIVERABLE	SCHEDULE
Mission Need Statement Approval	3QTRFY96
Milestone 0	3QTRFY96
Life Cycle Cost Estimate	1QTRFY01
Cost and Operational Effectiveness Analysis	1QTRFY01
Operational Requirement Document (ORD) Approval	3QTRFY01
Milestone I	1QTRFY02

Program Reviews

Both event driven reviews and regularly scheduled reviews will be conducted for this TD. The Director, AWT will conduct In Progress Reviews (IPR) semi-annually, beginning three months after program initiation. Event driven reviews such as Preliminary Design Reviews (PDR) or Critical Design Reviews (CDR) will precede major technical and program decisions and may supplement or supersede the semi-annual IPR schedule. Program progress will be briefed and a

written report submitted by the Technical Development Activity (TDA) for both scheduled and event driven reviews. Program Financial Status reports will be provided to the Director, AWT on a monthly basis.

Transitions

A Transition Plan for the ICOC to the appropriate PM for management will be developed. FY-00 POM initiatives for Demonstration and Validation (DEMVAL) and Engineering and Manufacturing Development (E&MD) Phases will be submitted by the Marine Corps.

Enclosures

Enclosure (1):	ICOC ATD Goals and Notional Requirements
Enclosure (2):	Transition Planning Worksheet

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INTEGRATED COMBAT OPERATIONS CENTER (ICOC)

ATD GOALS AND REQUIREMENTS

ATD GOALS	NOTIONAL OPERATIONAL REQUIREMENTS
Marine Air Ground Task Force (MAGTF) C4I baseline, shared Tactical Data Network, Technical Architecture for Information Management (TAFIM) Standards (FY99)	MAGTF C4I baseline, shared Tactical Data Network (FY99)
Decrease in total personnel (FY98)	Incur only modest increase* (FY98)
Promote intuitive decision making (FY97)	Promote intuitive decision making (FY97)
Promote assimilation of information, development of battlespace awareness and understanding of the tactical picture (FY97)	Composite images, animation/video/3-D (FY97)
Training, mission rehearsal, course of action analysis, and after action analysis (FY98)	Training, mission rehearsal, course of action analysis, and after action analysis (FY98)
Collaborative planning, distributed planning, fusion/user-pull/supply-push of information, integrated logistics (FY98)	Collaborative planning, distributed planning, fusion/user-pull/supply-push of information, integrated logistics (FY98)
MEF to MEU, Div/Wing to Bn/Sqdn+ and below (FY98)	Regimental (FY98)
Flexible and mobile (FY99)	Flexible and mobile (FY99)
Embedded training and education, embedded administration (FY01)	Embedded training and education (FY01)

*due to logistics and support
+ subset of capability

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TRANSITION PLANNING WORKSHEET

PROGRAM: INTEGRATED COMBAT OPERATIONS CENTER (ICOC)
ORIGINATOR: MARCORSYSCOM (AWT) PE: 63640M
TYPE: USMC ACAT: NON-ACAT
ORIG DATE: 01 OCT 95 REV DATE: ______

PHASE / MILESTONE	FY96 1 2 3 4	FY97 1 2 3 4	FY98 1 2 3 4	FY99 1 2 3 4	FY00 1 2 3 4	FY01 1 2 3 4	RESP/ REMARKS
6.2 Exploratory Development	* * * *	* * * *					ONR/NRaD
6.3 Adv. Tech. Demo. (ATD)	* * * *	* * * *	* * * *	* * * *	* * * *	* * * *	AWT/NRaD
DT-0				M			AWT/NRaD
OT-0						M	AWT/NRaD
Technical Documentation	* * * *	* * * *	* * * *	* * * *	* * * *	* * * *	AWT/NRaD
Mission Need Statement	D F						MCCDC
Operational Requirement Document						D F	MCCDC
Marine Corps Program Decision Meeting (0,I)							PM
6.4 through to Transition					* * * *	* * * *	PM
Final Documentation							PM
Initial Operational Capability (IOC)/ Full Operational Capability (FOC)							PM

Legend: (M) - Milestone, (---) - Timeline, (D) - Draft document, (F) - Final document, (T) - transfer to PM

FUNDING ($K)	FY95	FY96	FY97	FY98	FY99	FY00	FY01	RESPONSIBILITY
6.2	500	500	500					ONR
6.3			xxx	xxx				ONR
6.3		1,000	2,000	2,990	3,096	3,377	3,390	AWT
6.4						xxx	xxx	AWT/PM
Total	500	1,500	2500+	2990+	3,096	3377+	3390+	

Enclosure (2)

Objective

To develop and demonstrate a scaleable Combat Operations Center that promotes the presentation of higher level knowledge and understanding such that the decision maker operates both more rapidly and accurately. The development shall also be scaleable such that it applies to both higher and lower echelon levels.

Issues

None.

Status

Demonstrations of combining information for more accurate and faster decision making is ongoing activity for JWID95 and DARPA's Portable C4I for the JTF ATD.

Project Points of Contact

Maj T. Manley, MARCORSYSCOM (AW), Quantico, VA, DSN 278-4688
Mr. Robert Smille, NCCOSC/NRaD, San Diego, CA, DSN 619-553-8015

NON-ACQUISITION CATEGORY (NON-ACAT)
PROGRAM DEFINITION DOCUMENT (NAPDD)

FOR

TEAM TARGET ENGAGEMENT SIMULATION

NAPDD NO. 9302

PE 0603640 PROJECT NO. C2080

SUBMITTED:

DIRECTOR, AWT, MARCORSYSCOM

16 FEB 93
Date

REVIEWED:

C. W. Fulford Jr.
DIRECTOR, T&E DIVISION, MCCDC

18 FEB '93
Date

APPROVED:

COMMANDER, MARCORSYSCOM

3/11/93
Date

TASKING:

MARCORSYSCOM
ASSIGNED SYSCOM

31 MAR '93
Date

OASN(RD&A) DEPUTY FOR EFP

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

TEAM TARGET ENGAGEMENT SIMULATION (TTES)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

Purpose/Intent of Effort

The objective of this effort is to demonstrate a core technology that allows individuals and small units to train in a synthetic battlefield as a supplement and complement to standard field and range training. The training goal is to enhance the maintenance of critical and perishable combat skills, particularly in deployed and expeditionary settings. TTES will particularly benefit combat readiness in preparation for mid and low intensity conflicts. This effort will significantly reduce the cost and risk of adding these trainers to the Marine inventory.

Background. There is a critical need to provide training of mission level skills to individuals and small units. Mission level skills refers to the use of a variety of discrete skills (e.g., marksmanship, tactics) to accomplish a given mission. These set of discrete skills are often perishable and difficult to maintain, particularly in deployed and expeditionary settings. By creating a synthetic training environment, TTES will address perishable and critical close quarter and infantry combat skills to include close quarter battle marksmanship.

TTES will make significant strides in achieving capabilities articulated in the Marine Corps Long Range Plan of 28 June 1991: interoperability between real mission performance and training, combined arms training at the small unit level with emphasis on the low and mid intensity levels of conflict, enhance individual physical performance through training programs which promote individual combat skills, and develop state of the art simulators which can be used to train all Marines.

The initial focus for the TTES effort will be Military Operations in Urban Terrain (MOUT) scenarios for two basic reasons. First, the rectilinear nature and defineability of urban terrain provides the appropriate technical challenge and coverage of variables. Second, the importance of training for MOUT and, closely related, special operations capable (SOC) are indicated in the MAGTF Master Plan of 28 June 1991. A greater and more immediate payoff is expected from the MOUT scenarios, given the potential of operational occurrence and the routine access to quality training facilities.

Status. Reflecting the rapid maturation of the advanced simulation technology, the TTES ATD is a new start. To address the deficiencies stated in paragraph 1.a. above requires a core capability that allows individuals and small units to conduct training exercises in synthetic urban areas, where computer controlled hostiles are engaged with a variety of infantry and supporting arms. The risks and costs of developing and evaluating the core technology are reduced by leveraging existing and evolving technologies at the U.S. Army Simulation Training and Instrumentation Command (STRICOM) and at the Naval Training Systems Center (NTSC). The payoffs for this leveraging include data base management, computer controlled combatants, trainee interface, visual displays, mission previewing and rehearsing, and networking with other simulations and training systems. A parallel USMC Exploratory Development Task focusing on the behavior aspects of training for MOUT in a Virtual Environment or on a Synthetic Battlefield will contribute efficiency and optimization to the technology development.

Technical Approach / Scope of Effort

The ATD will develop and evaluate the feasibility and utility of a core technology for a family of TTES training devices. The initial focus will be MOUT operations. Affordability for wide Marine Corps fielding is a critical design feature. Information and concept interchange will occur with a behavioral based exploratory development task on the use of virtual reality for training. The technology work areas are: Data bases for synthetic urban areas, weapon modeling, computer controlled combatants, human controlled combatants/trainee interface, visual displays, scenarios creation, exercise control, instructional features, networking, and the interactive nature of trainers. The notional requirements are presented in Enclosure (1).

The visual system will consist of a PC based image generator, projector and large screen, height sensors, and stereo glasses. The weapon system will consist of a M16 and electromagnetic aim measurement system. A circular pressure sensitive surface mounted on the floor will allow the trainee to move about the synthetic urban area and a loudspeaker and amplifier will provide sound effects. Hostiles that the trainee engages will be controlled by the computer. The TTES will allow the trainee to initialize, conduct, and debrief training exercises for MOUT. While conducting training exercises in deployed settings, the trainee must be able to operate in synthetic urban area and engage computer controlled hostiles with a variety of weapons. The upper limit of this family of systems would allow multiple members of small units to train with each other in interactive and realistic scenarios. Specifically, the user will:

a. Tactically move within the synthetic urban area

b. Have a 3-D visual representations of urban areas

c. Participate in small unit force-on-force engagements with computer controlled hostiles

d. Coordinate and communicate with other small units

Resource Summary

FUNDING ($000)	FY93	FY94	FY95	FY96	FY97
6.2	325	350	350		
6.3a	1,000	1,500	2,000		
6.3b				750	1,000

ATD Deliverables/Milestones

DELIVERABLE/MILESTONE	SCHEDULE
Program Initiation	1QTRFY93
Technology Management Plan	3QTRFY93
Mission Need Statement	2QTRFY94
Critical Design Review	2QTRFY94
Detailed Developmental (DT-0) / Operational Test (OT-0) Plan	3QTRFY4
Milestone 0	4QTRFY94
Test and Evaluation Master Plan	4QTRFY94
Integrated Program Summary	2QTRFY95
DT/OT-0	3QTRFY95
Preliminary Integrated Logistics Support Plan	4QTRFY95
Life Cycle Cost Estimate	4QTRFY95
Operational Requirement Document	1QTRFY96
Milestone I	1QTRFY96

Program Reviews

In addition to event driven reviews, the Director AWT will conduct progress and financial reviews triannually beginning four months after program initiation.

Transition

The work areas of advanced simulation technology are currently reaching the technological maturity where practical applications can be considered. The pace of technological evolution is relatively rapid. Transition plans and future developmental efforts are not yet specified. Out year definition is expected as a result of Program Objective Memorandum (POM)

96 initiatives. Fielding of synthetic battlefield trainers can be expected in the 1992-2002 time frame. Management of the ATD will transition in accordance with Enclosure (2).

<u>Enclosures</u>

Enclosure (1):	TTES ATD Goals and Requirements
Enclosure (2):	Transition Planning Worksheet (TPW)

TEAM TARGET ENGAGEMENT SIMULATION (TTES)

ATD GOALS AND REQUIREMENTS

CATEGORY	ATD GOAL	REQUIREMENT
Weapon: - Multiple types - Accuracy	- 4 - 80%	- Complete Marine infantry inventory - 100%
Visual display: - Field of view - Depth perception -Update rate - Latency	 50% Yes 15 Hz 50 ms	 Full Yes 30 Hz 20 ms
Movement within urban area: - Naturalness - Different gaits	 75% Walk and run	 Unencumbered Walk, run, and crawl
Computer controlled hostiles: - Graphical representation - Tactics - Weapons number	 - IFF; weapon type, stiff movements - Interactive, not predictive, not adaptive, not intelligent, limited cooperation - 4	 - IFF neutral; weapon type, human like movement - Interactive, not predictive, adaptive, intelligent, cooperative - Entire infantry inventory
Interactiveness: - Number of trainess - Auditory	 - 6 - Representative sound	 - Reinforced rifle squad - Sound and vibration; identify source
Terrain model: - Modifiable with weapons - Environmental attributes	 - Single weapon - Daylight, haze	 - Multiple and simultaneous weapons - Fog, dust, day/night
Instructional features: - Replay - Dedicated instructor - Diagnostics	 - Limited - No - 80%	 - Full - No - Full

Enclosure (1)

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TRANSITION PLANNING WORKSHEET

PROGRAM: TEAM TARGET ENGAGEMENT SIMULATOR (TTES)
ORIGINATOR: MARCORSYSCOM (AWT)
TYPE: USMC ACAT: NON-ACAT
ORIG DATE: 16 FEB 93 REV DATE: ______

PHASE / MILESTONE	FY92 1 2 3 4	FY93 1 2 3 4	FY94 1 2 3 4	FY95 1 2 3 4	FY96 1 2 3 4	FY97 1 2 3 4	RESP/ REMARKS
6.2 Exploratory Development		---------	---------	---------			AWT
6.3a Advanced Technology Demonstration		---------	---------	---------			AWT
Technical Documentation		---------	---------	---------			NTSC/NPDC
Mission Need Statement		D	F				MCCDC
Integrated Program Summary			D	F			AWT / PM TRISYS
Cost and Operational Effectiveness Analysis				D F			MCCDC
Operational Requirement Document				D	F		MCCDC
Marine Corps Program Decision Meeting (0-I)			M				AWT/PM TRISYS
6.3b through fielding							PM TRISYS

Legend: (M) - Milestone, (---) - Timeline, (D) - Draft document, (F) - Final document

FUNDING	FY92	FY93	FY94	FY95	FY96	FY97	RESP / REMARKS
6.2		325	350	350			AWT
6.3a (NON-ACAT)		1,000	1,500	2,000			AWT
6.3b - 6.4					750	1,000	PM Intell
Other							
Procurement							
Total (USMC)		1,325	1,850	2,350	750	1,000	

Enclosure (2)

Objective

Demonstrate a core technology that will be the basis for a family of synthetic battlefield training simulators that will allow individuals and small units to maintain critical/perishable combat skills.

Status

(1) Leverages ongoing Defense Advanced Research Projects Agency (DARPA)/Army/Navy developments.
(2) Behavioral and training system support is provided by a parallel USMC 6.2 Exploratory Development Task performed by NPRDC.

Issues

None.

Project Points of Contact

LtCol W. Hamm, Marine Corps Systems Command (AWT), 703-784-4790, DSN 278
Dr. D. Fowlkes, Naval Training Systems Center, 407-380-4789, DSN 960

NON-ACQUISITION CATEGORY PROGRAM DEFINITION DOCUMENT (NAPDD)

for

JOINT MODELING AND SIMULATION (Joint M&S)

NAPDD NO. __________

PE 063640M

DRAFT

Submitted:

______________________________ __________

Director, AWT, MARCORSYSCOM Date

Reviewed:

______________________________ __________

Director, Requirements Division, MCCDC Date

Approved:

______________________________ __________

Commander, MARCORSYSCOM Date

AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134-5080

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
MARINE CORPS SYSTEMS COMMAND
QUANTICO, VIRGINIA 22134

NON-ACAT PROGRAM DEFINITION DOCUMENT (NAPDD)

for the

JOINT MODELING AND SIMULATION (Joint M&S)

ADVANCED TECHNOLOGY DEVELOPMENT (ATD) PROJECT

A NAPDD for this ATD project is currently being drafted.

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ANNEX E

THE ADVANCED TECHNOLOGY DEMONSTRATION (ATD) PROCESS, AS IT SUPPORTS THE COMBAT DEVELOPMENT PROCESS (CDP)

THE ATD PROCESS

The ATD process is conducted in accordance with a Department of the Navy and Marine Corps Policy and provides the following:

a. Bridge 6.2 (Applied Research) and 6.4/6.5 (Advanced Development/Engineering Development)

b. Identify and reduce technology risk prior to committing to Acquisition Category (ACAT) program

c. Help define the operational requirement

d. Identify development options/associated cost and military worth

e. Achieve user/develop consensus

f. Demonstrate technology feasibility and operational utility in a quasi-operational environment

g. Establish basis for the Concept Exploration and Development (CE&D) and Demonstration/Validation (DEM/VAL) phases

h. Support the Cost and Operational Effectiveness Analysis (COEA) effort

I. Smooth MS I decision and enter development without pause.

The ATD process is a key element of the science and technology strategy, and bridges the science and technology base with the acquisition process (see Figure E-1 and E-2).

ATD PLAYERS AND RESPONSIBILITIES

Marine Corps Systems Command (MARCORSYSCOM), which acts as the technology developer (AWT Directorate) and as the system developer (Program Managers), is the lead activity for ATDs. The Command provides linkage to 6.2 and other Department of Defense technology base programs. MARCORSYSCOM AWT produces the NAPDD which initiates the ATD. MARCORSYSCOM, in cooperation with the Marine Corps Combat Development

Command (MCCDC) as combat developer, defines the system concept and prepares the technical engineering plans, documentation, and reports. MARCORSYSCOM plans and budgets 6.4/6.5/PMC and manages the ACAT program.

The NAPDD provides written guidance on the expectations of agreements between COMMARCORSYSCOM/CG MCCDC and the ASN, (RDA). It establishes approval, deliverable, schedule and cost agreements and is valid for 3 to 5 years max (revalidated). The elements of the NAPDD, formatted IAW SECNAVINST 5000, are:

a. Purpose/Intent

b. Scope

c. Resource Summary

d. Deliverables/Schedules/Milestone

e. Program Reviews

f. Initial Statement of ATD Goals and Notional Operational Requirements.

The NAPDD defines the system concept, major program milestones, and funding required. Attachments to the NAPDD include the ATD notional program goals sheet, and the Transition Planning Worksheet (TPW). The TPW shows the milestones and coordination required in the acquisition cycle form 6.2 through fielding. The TPW is coordinated between AW, MCCDC and the receiving PM. See Annex D for the NAPDDs for the ATDs described in this document.

The MCCDC serves as the system proponent for the user community and performs threat/operational/effectiveness assessments. It defines the operational environments, employment concepts, and military worth. It assesses the suitability of demonstrated technology. MCCDC prepares the Mission Need Statement (MNS) and the Operational Requirements Document (ORD), and conducts the COEA.

ATD PHASES

Phases of the ATD Process are shown on Figure E-3.

THE TRANSITION PROCESS

The transition is depicted on Figure E-4.

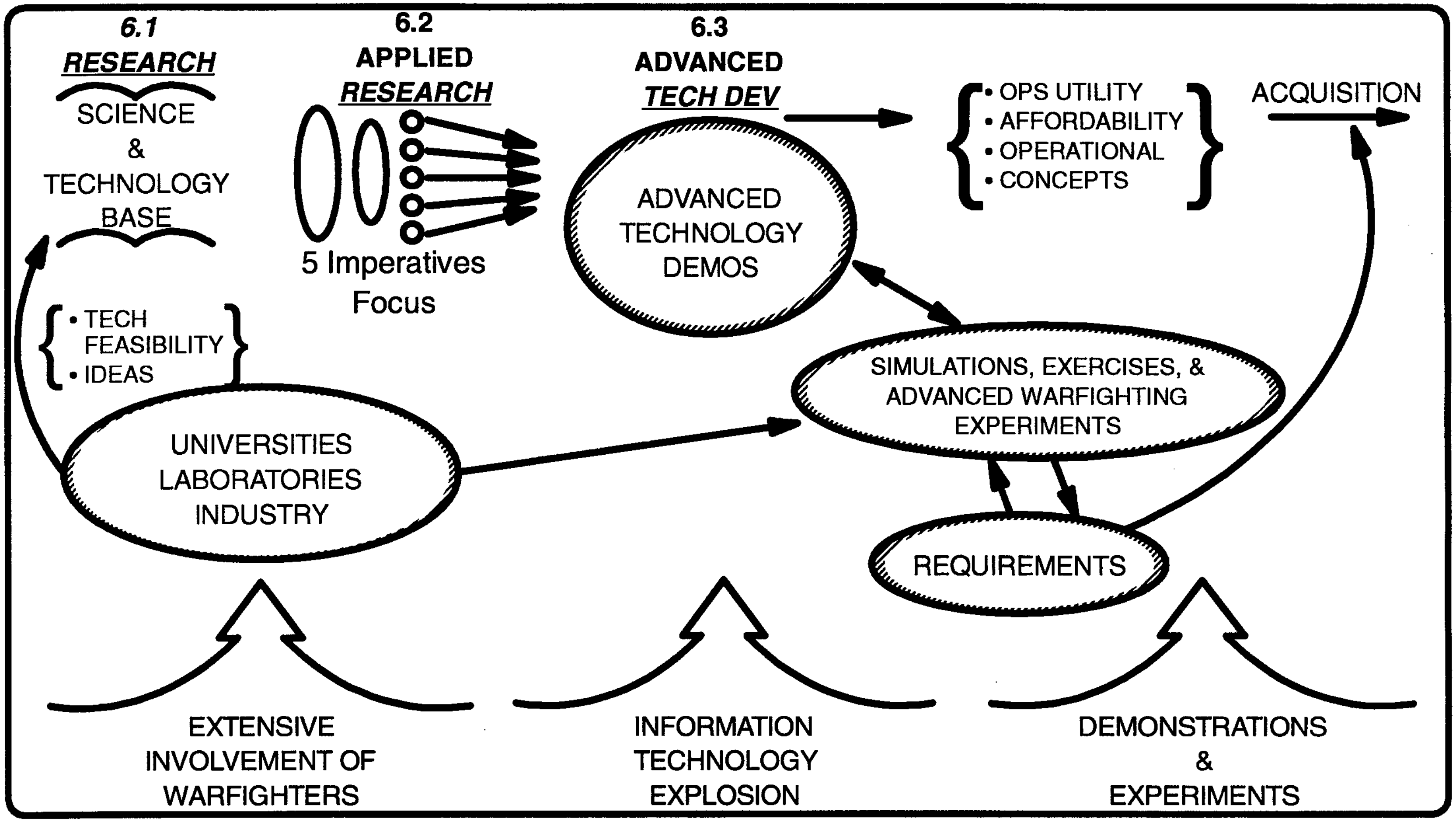

FIGURE E-1. THE S&T STRATEGY

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AMPHIBIOUS WARFARE TECHNOLOGY DIRECTORATE
ACQUISITION STRATEGY FOR TRANSITION PROGRAMS

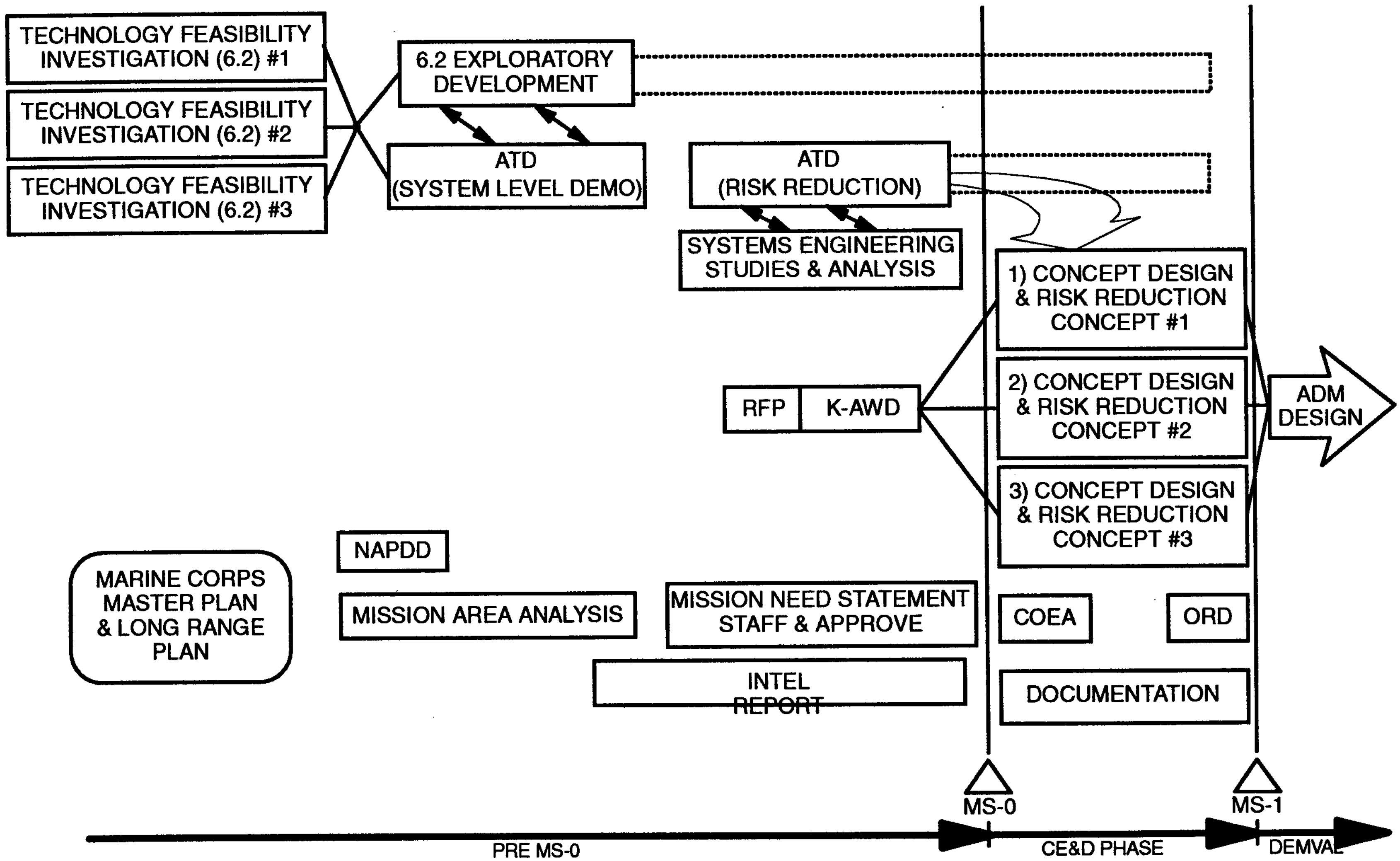

FIGURE E-2. COMBAT DEVELOPMENT PROCESS (CDP) AND ACQUISITION PROCESS INTEGRATED MODEL

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YEAR 1

- DEVELOP CONCEPT(S)
- CONDUCT TRADE-OFF STUDIES
- ASSESSMENTS AS NECESSARY
- BEGIN BASIC DESIGNS
  - SELECT BASIC APPROACH(ES)
  - AWARD CONTRACT(S)
  - PRELIMINARY DESIGN REVIEW (PDR)

YEAR 2

- COMPLETE DETAILED DESIGNS
- CONDUCT CDR
- START FABRICATION OF PROTOTYPES
- DT COMPONENTS
- PLAN OT-0
- MS-0
- AWARD CONTRACT(S)

YEAR 3

- FINISH FABRICATION
- DT-0 SYSTEM (TECH EVAL)
- OT-0 SYSTEM (USER TEST/DEMO)
- TRANSITION DOCUMENTATION
- MS-1 DOCUMENTATION
- SUGGESTED PERFORMANCE SPECS
- DRAFT ORD

FIGURE E-3. ATD ACTIVITIES

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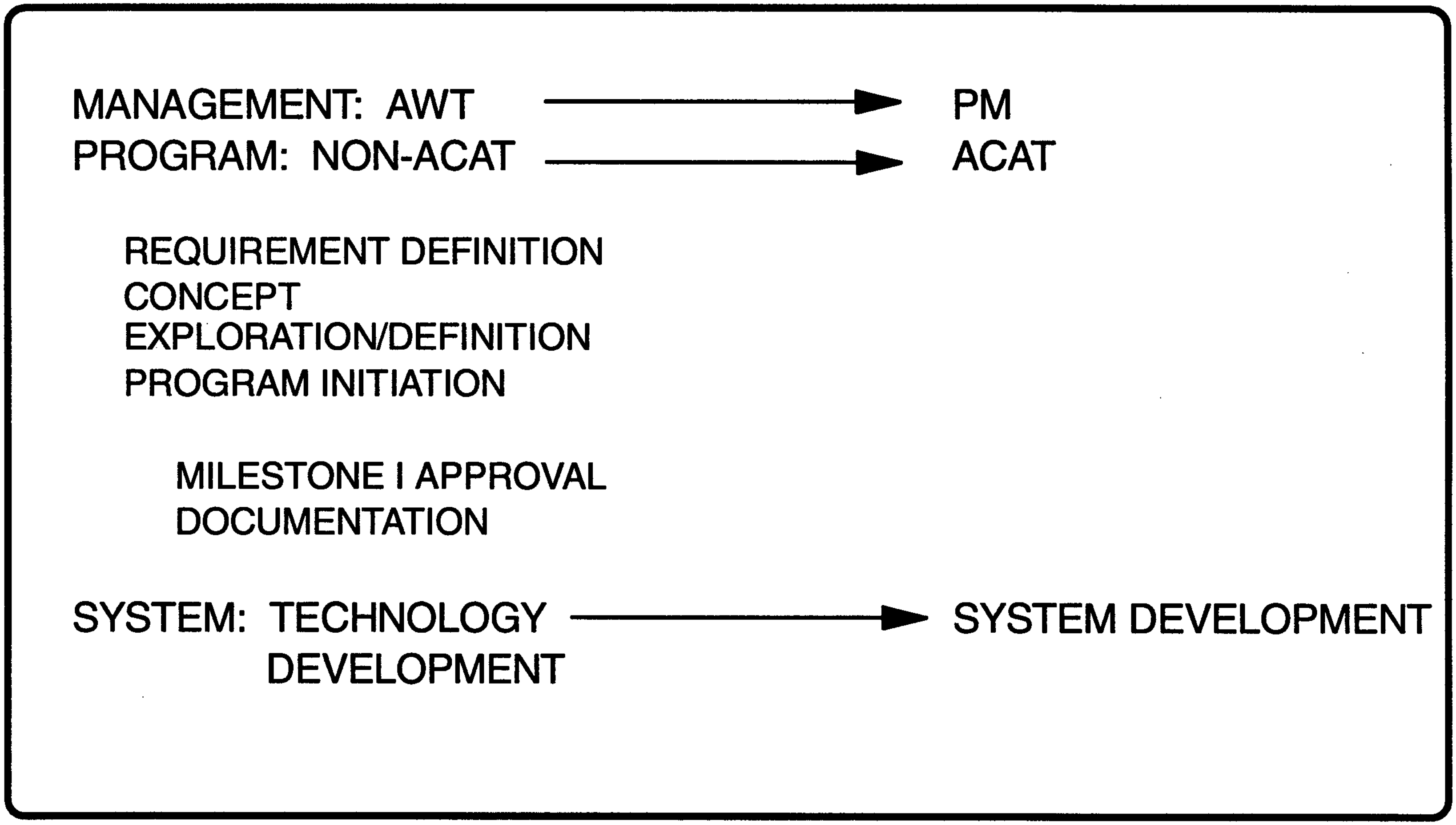

FIGURE E-4. THE TRANSITION PROCESS

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